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Willow Master Development Plan

Supplemental Environmental Impact Statement

FINAL

Volume 10: Appendices E.14 to I.3

January 2023

Prepared by:
U.S. Department of the Interior
Bureau of Land Management
Anchorage, Alaska

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Native Village of Nuiqsut
Iñupiat Community of the Arctic Slope
City of Nuiqsut
North Slope Borough
S[illegible]a

E[illegible]al Costs Associated
w[illegible]ng and Producing this SEIS: $3,350,000

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W56
2023
v.10

Mission

To sustain the health, diversity, and productivity of the public lands for the future use and enjoyment of present and future generations.

Cover Photo Illustration: North Slope Alaska oil rig during winter drilling.
Photo by: Judy Patrick, courtesy of ConocoPhillips.

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Willow Master Development Plan

Appendix E.14
Land Ownership and Use Technical Appendix

January 2023

North Slope Borough Ordinance
Serial No. 75-06-75

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NORTH SLOPE BOROUGH
ORDINANCE SERIAL NO. 75-06-75

AN AMENDED ORDINANCE APPROVING THE WILLOW PROJECT MASTER PLAN AND AMENDING THE OFFICIAL ZONING MAP OF THE NORTH SLOPE BOROUGH TO REZONE AS RESOURCE DEVELOPMENT DISTRICT THOSE LANDS NEEDED TO DEVELOP THE WILLOW PROJECT

WHEREAS, pursuant to North Slope Borough Municipal Code (NSBMC) § 19.60.060, ConocoPhillips Alaska, Inc. (CPAI) has applied for approval of its existing Master Plan for the Willow development and to amend the official zoning map to rezone from Conservation District to Resource Development District those lands that are needed for development of its Willow project; and

WHEREAS, the lands proposed to be rezoned are shown in the map attached as Exhibit 1; and

WHEREAS, in accordance with NSBMC § 19.60.060 the North Slope Borough Planning Commission held a public hearing at its meeting on December 17, 2020 to review the rezone and proposed Master Plan for the area; and

WHEREAS, at its December 17, 2020 meeting, the Planning Commission did not approve Resolution 2020-17, attached as Exhibit 2, recommending that the Assembly approve the Rezone and Master Plan, provided CPAI or any owner/operator follows the conditions, general stipulations and advisory language set forth in the Final Staff Recommendations by a vote of 2 yes and 5 no; and

WHEREAS, the Planning Commission approved a motion to return the application to CPAI for modification to rezone a limited area by a vote of 6 yes and 1 no; and

WHEREAS, the Final Staff Recommendations are attached as Exhibit 3; and

WHEREAS, the proposed rezone complies with the policies in Chapter 19.70; and

WHEREAS, the proposed rezone is in an area with adequate services, including roads, parking, boardwalks, water, sewer, garbage collection, gas, electricity, drainage, police and fire protection or the developer has agreed to provide all the necessary improvements or services for the area; and

WHEREAS, the comments from reviewing parties on the proposed rezoning have been adequately addressed; and

WHEREAS, there is a demonstrated need for additional land in the zoning district being requested; and

WHEREAS, the resulting district or expanded district will be a logical, integrated area and will not constitute spot zoning; and

WHEREAS, a master plan is available for the area to be developed; and

WHEREAS, in accordance with NSBMC § 19.60.060 the Assembly shall review and act on a rezoning by ordinance. The Assembly shall consider the application and Planning Commission recommendation; and

WHEREAS, the legal description for the areas to be rezoned to Resource Development District are as follows:

Township 9 North, Range 1 East, Sections 1, 2(NE ¼, S ½), 3(S ½), 7, 8, 9, 10, 11, 12(N ½, SW ¼), 15(N ½), 16, 17, 18, 19, 20, 21(NW ¼), 29(NW ¼) and 30(N ½, SW ¼), Umiat Meridian, Alaska.
Township 9 North, Range 1 West, Sections 2(W ½), 3, 4(E ½), 10, 11, 12, 13, 14, 15(E ½), 21(SE ¼), 22 (NE ¼, S ½), 23, 24, 25, 26, 27, 28, 29(SE ¼), 32(NE ¼), 33, 34(N ½), 35(N ½) and 36(NW ¼), Umiat Meridian, Alaska.
Township 9 North, Range 2 East, Sections 5(N ½, SW ¼), 6 and 7(NW ¼), Umiat Meridian, Alaska.
Township 10 North, Range 1 East, Sections 35(SE ¼) and 36(S ½), Umiat Meridian, Alaska.
Township 10 North, Range 1 West, Sections 2(S ½), 3(SE ¼), 9(SE ¼), 10, 11, 14(W ½), 15, 16(NE ¼), 22, 23(W ½), 26(NW ¼), 27, 28(E ½), 33(E ½), and 34, Umiat Meridian, Alaska.
Township 10 North, Range 2 East, Sections 12(SE ¼), 13(NE ¼, S ½), 23(SE ¼), 24(W ½), 26(NE ¼), 31(S ½) and 35(NW ¼), Umiat Meridian, Alaska.
Township 10 North, Range 3 East, Sections 1(SW ¼), 2(S ½), 3, 4, 5(S ½), 7, 8, 9, 10, 11, 12, 13(SW ¼, N ½), 14(N ½), 16(N ½), 17(N ½) and 18(N ½), Umiat Meridian, Alaska.

NOW, THEREFORE, BE IT ENACTED:

SECTION 1. Classification. This ordinance is a non-code ordinance.

SECTION 2. Severability. If any provision of this ordinance or any application thereof to any person or circumstance is held invalid, the remainder of this

ordinance and the application to other persons and circumstances shall not be affected thereby.

SECTION 3. Effectiveness. This code ordinance shall become effective immediately upon adoption.

SECTION 4. Approval.

1. The North Slope Borough Assembly approves the Master Plan.

1. The North Slope Borough Assembly amends the Official Zoning Map by rezoning the above legally described area of Willow from Conservation District to Resource Development District subject to the conditions, general stipulations, mitigation measures and advisory language set forth in the Final Staff Recommendations, Exhibit 3 and the Proposed Conditions of Approval In Response to Kuukpik Comments, Exhibit 4. The Official Zoning Map and the master digital copy of the Official Zoning Map shall be updated by the NSB Planning Department to reflect this amendment.

INTRODUCED: December 1, 2020
ADOPTED: January 15, 2021

John Hopson, Jr., President
Date: 01-15-2021

ATTEST:
Sheila Burke, Borough Clerk
Date: 01-15-2021

Harry K. Brower, Jr., Mayor
Date: 01-15-2021

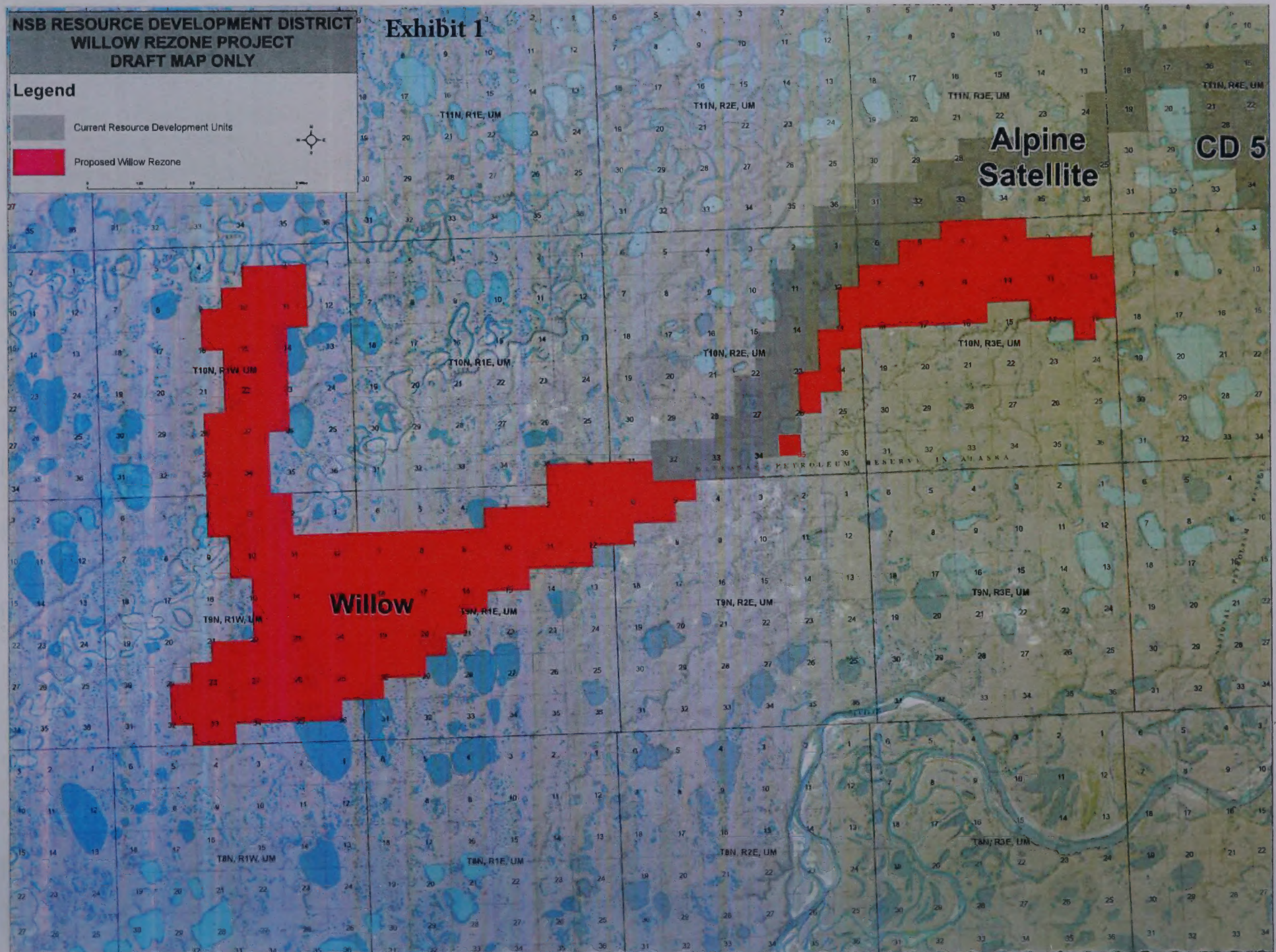
NSB RESOURCE DEVELOPMENT DISTRICT
WILLOW REZONE PROJECT
DRAFT MAP ONLY
Exhibit 1
Legend
Current Resource Development Units
Proposed Willow Rezone
Alpine Satellite
CD 5
Willow
T11N, R1E, UM
T11N, R2E, UM
T11N, R3E, UM
T11N, R4E, UM
T10N, R1W, UM
T10N, R1E, UM
T10N, R2E, UM
T10N, R3E, UM
T9N, R1W, UM
T9N, R1E, UM
T9N, R2E, UM
T9N, R3E, UM
T8N, R1W, UM
T8N, R1E, UM
T8N, R2E, UM
T8N, R3E, UM

Exhibit 2

NORTH SLOPE BOROUGH PLANNING COMMISSION
RESOLUTION SERIAL NO. 2020-17

A RESOLUTION RECOMMENDING THAT THE ASSEMBLY APPROVE THE MASTER PLAN AND AMEND THE OFFICIAL ZONING MAP OF THE NORTH SLOPE BOROUGH TO REZONE AS RESOURCE DEVELOPMENT DISTRICT THOSE LANDS NEEDED TO DEVELOP THE WILLOW PROJECT

WHEREAS, ConocoPhillips Alaska, Inc. (CPAI) has submitted to the North Slope Borough (NSB) an application for approval of its existing Master Plan for the Willow development and to amend the official zoning map to rezone from Conservation District to Resource Development District those lands that are needed for development of its Willow project; and

WHEREAS, pursuant to North Slope Borough Municipal Code (NSBMC) §19.30.050 the Planning Commission shall review and make recommendations to the Assembly on all rezoning requests outside the City of Utqiaġvik; and

WHEREAS, the proposed rezone complies with the policies in Chapter 19.70; and

WHEREAS, the proposed rezone is in an area with adequate services, including roads, parking, boardwalks, water, sewer, garbage collection, gas, electricity, drainage, police and fire protection or the developer has agreed to provide all the necessary improvements or services for the area; and

WHEREAS, the comments from reviewing parties on the proposed rezoning have been adequately addressed; and

WHEREAS, there is a demonstrated need for additional land in the zoning district being requested; and

WHEREAS, the resulting district or expanded district will be a logical, integrated area and will not constitute spot zoning; and

WHEREAS, a master plan is available for the area to be developed; and

WHEREAS, the lands proposed to be rezoned are shown in the map attached as Exhibit A; and

WHEREAS, the Planning Commission held a public hearing at the Regular Meeting on December 17, 2020; and

WHEREAS, the Planning Commission recommends that the Assembly approve the rezone application provided that CPAI or any owner/operator complies with the conditions, general stipulations and advisory language set forth in the Final Staff Recommendations.

NOW THEREFORE BE IT RESOLVED THAT:

1. The North Slope Borough Planning Commission recommends that the Assembly approve the Master Plan.

2. The Planning Commission recommends that the Assembly amend the official zoning map to rezone as a Resource Development District the following lands needed to develop the Willow project:

Township 9 North, Range 1 East, Sections 1, 2(NE ¼, S ½), 3(S ½), 7, 8, 9, 10, 11, 12(N ½, SW ¼), 15(N ½), 16, 17, 18, 19, 20, 21(NW ¼), 29(NW ¼) and 30(N ½, SW ¼), Umiat Meridian, Alaska.
Township 9 North, Range 1 West, Sections 2(W ½), 3, 4(E ½), 10, 11, 12, 13, 14, 15(E ½), 21(SE ¼), 22 (NE ¼, S ½), 23, 24, 25, 26, 27, 28, 29(SE ¼), 32(NE ¼), 33, 34(N ½), 35(N ½) and 36(NW ¼), Umiat Meridian, Alaska.
Township 9 North, Range 2 East, Sections 5(N ½, SW ¼), 6 and 7(NW ¼), Umiat Meridian, Alaska.
Township 10 North, Range 1 East, Sections 35(SE ¼) and 36(S ½), Umiat Meridian, Alaska.
Township 10 North, Range 1 West, Sections 2(S ½), 3(SE ¼), 9(SE ¼), 10, 11, 14(W ½), 15, 16(NE ¼), 22, 23(W ½), 26(NW ¼), 27, 28(E ½), 33(E ½), and 34, Umiat Meridian, Alaska.
Township 10 North, Range 2 East, Sections 12(SE ¼), 13(NE ¼, S ½), 23(SE ¼), 24(W ½), 26(NE ¼), 31(S ½) and 35(NW ¼), Umiat Meridian, Alaska.
Township 10 North, Range 3 East, Sections 1(SW ¼), 2(S ½), 3, 4, 5(S ½), 7, 8, 9, 10, 11, 12, 13(SW ¼, N ½), 14(N ½), 16(N ½), 17(N ½) and 18(N ½), Umiat Meridian, Alaska.

Passed and approved by a duly constituted quorum of the North Slope Borough Planning Commission.

INTRODUCED: _____

ADOPTED: _____

_____
Paul Bodfish Sr., Chairman

_____
Date

_____,
Clerk

_____
Date:

Exhibit 3

North Slope Borough

PLANNING AND COMMUNITY SERVICES DEPARTMENT

P.O. Box 69
Barrow, AK 99723
☎ (907) 852-0320
Fax: (907) 852-0322
Email: rhoda.ahmaogak@north-slope.org

Gordon R. Brower, Director

To: Planning Commission

From: Gordon R. Brower, Land Management Administrator

Date: December 10, 2020

RE: STAFF RECOMMENDATION – NSB/RZ 21-001, Willow Rezone and Master Plan, Various Townships, Ranges & Sections, Umiat Meridian, Conservation District.

NSB Staff - employees involved in the preparation of this staff recommendation and analysis: Lilly Kilapsuk, Land Management Specialist; Price Leavitt, LMR Manager; Mabel Kaleak, Deputy Director of Planning; Brian Person, Wildlife Biologist; Gordon Brower, Director of Planning.

Project Description

Introduction

ConocoPhillips (Alaska) Inc. (CPAI) has submitted this Master Plan to support a rezoning request for the initial phase of the Willow Development area, including gravel infrastructure, regularly constructed ice roads, and other ancillary facilities required for the economic production and transportation to market of oil and gas resources from the BTU while protecting important surface resources and ensuring safe operations.

CPAI requests that the North Slope Borough (NSB) rezone 37,654 acres of land to Resource Development District (RDD). These include all lands underlying proposed gravel roads, gravel pads, infield pipelines, annual ice roads, and ice pads to be constructed in the first phase of development (Phase 1). The rezone request does not include: (1) facilities already within an RDD or (2) lands underlying proposed drillsites Bear Tooth 4 (BT4) and Bear Tooth 5 (BT5) and their associated roads and pipelines (Phase 2), although these facilities and activities are described in this Master Plan. CPAI will submit a rezoning request for Phase 2 development under separate cover prior to beginning activities.

An Environmental Impact Statement (EIS) has been prepared by the U.S. Department of the Interior's Bureau of Land Management (BLM) in support of the National Environmental Policy Act (NEPA) process to evaluate the Project facilities located on leased federal lands on the North Slope of Alaska in the Northeast National Petroleum Reserve-Alaska (NPR-A), within the NSB

(BLM 2019-2020). This Master Plan is based on CPAI's proposed action. For cross reference, the proposed action is described as Alternative B and Module Delivery Option 3 in the Willow Master Development Plan Final EIS (BLM 2020). A final Record of Decision (ROD), anticipated to be published in September 2020, has not been issued for the Project as of the date of this submittal. To support consistency between authorizations, CPAI has proposed mitigation measures that were developed to meet multiple agencies' requirements.

Project Overview

The Project includes the Willow Central Processing Facility (WCF) and a total of five drillsites, three drillsites in Phase 1 and two drillsites in Phase 2. Support facilities include the Willow Operations Center (WOC), airstrip and apron, four valve pads, four pipeline pads, one water source access pad each at the constructed freshwater reservoir (CFWR) and at Lake L9911, and a communications tower pad. The Project will be connected to the GMTU by pipelines and gravel road. The pipelines and gravel roads will also connect all drillsites to the WCF. Gravel road features include seven bridges, up to three subsistence boat ramps, and eight subsistence tundra access pullouts. The Project also includes development of two gravel mine sites and the CFWR. The CFWR will serve as the primary fresh water source for Project facilities. Ice road and ice pads will be used to support project construction, including seasonal connection to the gravel mine sites, and to facilitate mobilization of WCF and drillsite modules from Oliktok Dock, within the Kuparuk River Unit (KRU), via a heavy-haul ice crossing of the Colville River near Ocean Point. Table 4-1 summarizes the major Project components.

Location

Project	Township	Range	Section(s)
Willow RDD Proposed Rezone	9 North	1 East	1, 2 (NE ¼, S ½), 3 (S ½), 7, 8, 9, 10, 11, 12 (N ½, SW ¼), 15 (N ½), 16, 17, 18, 19, 20, 21 (NW ¼), 29 NW ¼), 30 (N ½, SW ¼)
	9 North	1 West	2 (W ½), 3, 4 (E ½), 10, 11, 12, 13, 14, 15 (E ½), 21 (SE ¼), 22 (NE ¼, S ½), 23, 24, 25, 26, 27, 28, 29 (SE ¼), 32 (NE ¼), 33, 34 (N ½), 35 (N ½), 36 (NW ¼)
	9 North	2 East	5 (N ½, SW ¼), 6, 7 (NW ¼)
	10 North	1 East	35 (SE ¼), 36 (S ½)
	10 North	1 West	2 (S ½), 3 (SE ¼), 9 (SE ¼), 10, 11, 14 (W ½), 15, 16 (NE ¼). 22, 23 (W ½), 26 (NW ¼), 27, 28 (E ½), 33 E ½), 34
	10 North	2 East	12 (SE ¼), 13 (NE ¼, S ½), 23 (SE ¼), 24 (W ½), 26 (NE ¼), 31 (S ½), 35 (NW ¼)
	10 North	3 East	1 (SW ¼), 2 (S ½), 3, 4, 5 (S ½), 7, 8, 9, 10, 11, 12, 13 (SW ¼, N ½), 14 (N ½), 16 (N ½), 17 (N ½), 18 (N ½)

Chronology of Events

- May 18, 2020 –Pre- application meeting with ConocoPhillips.
- June 9, 2020- Willow Saturation Conference meeting regarding Studies with CPAI.
- July 8, 2020- Willow Saturation Conference meeting regarding Rezone Process with CPAI.
- July 29, 2020- Willow Master Plan Page Turn meeting with CPAI.
- August 31, 2020- 2nd Willow Master Plan Page Turn meeting with CPAI.
- September 17, 2020- Last Willow Master Plan Page Turn meeting with CPAI.
- September 22, 2020- Master Plan application received from CPAI.
- October 28, 2020- Virtual Scoping Meeting was held.
- December 3, 2020- Scoping Meeting via teleconference was held.
- December 4, 2020- Stakeholder Meeting via teleconference was held.

Public Comments

In addition to the opportunity to provide written comments based on the draft recommendation, three opportunities for public comments were held to collect Nuiqsut concerns about this project, prior to meeting with the NSB Planning Commission. The first opportunity was a virtual scoping meeting held on October 28, 2020 during ConocoPhillips update meeting to the Community. The second opportunity was a scoping meeting via teleconference on December 3, 2020 and the third opportunity was the Stakeholder Meeting via teleconference on December 4, 2020, with community stakeholders from the City of Nuiqsut, the Native Village of Nuiqsut and Kuukpik Corporation in a joint meeting with Borough officials and Conoco Phillips. The comments and concerns from those meetings are listed below.

October 28, 2020- Virtual Scoping Meeting

During the Virtual Scoping Meeting on October 28. 2020, NSB Planning Department Staff discussed the project with the residents of Nuiqsut. Comments focused on the need for baseline information, monitoring of project effects, and ensuring local economic benefits.

Residents of Nuiqsut had the following comments/questions;

- Who will monitor these sites for ground failure if the infrastructure will settle over the years after construction of new infrastructure? There are many changes of permafrost and concerns that this new infrastructure will create more change to the existing permafrost I areas so it's critical to have monitoring for changes to the wetlands as well.
- Request to replace a culvert by the fire station in Nuiqsut.
- There is an ice road 2 miles from Alpine Resupply, another ice road from Meltwater to Ocean Point the onto Willow, why going south vs. using the Alpine Resupply?
- Questions about the boat ramp locations.
- What significant changes to BT4 & BT5 do you think may happen between now and when you try get approval for them in a few years?

December 3, 2020 Scoping Meeting via Teleconference:

This was a teleconference meeting with the residents of Nuiqsut and The Planning Department to collect comments and concerns from the community. This meeting was held for the benefit of Nuiqsut residents, to give due deference to their comments and concerns.

- Concerned it is a quick process, need to monitor the permafrost conditions and it vitally important to region as it holds the wetlands and ecosystems together.
- We will have hard time hunting, been hunting since we came to Nuiqsut, the development is heading towards the west.
- The caribou follow the Price River to Teshekpuk, fall time they use that trail a lot. There's lots of water fowl. That area the animals use, now they are moving different.
- Our hunting grounds are running out, oil industry is exploring too much, so we can't hunt.
- Atqasuk and Barrow will feel the hurt we've been feeling.
- The oil industry lied to us, they said we would have a road before Alpine was built, to this day there is still no road.
- When industry spill diesel or other fluids, they do not clean it up, they don't report it, when we stop while travelling we can smell the diesel that was spilled.
- Large project for the area they are proposing and the processing facility, felt the impacts from the satellites from Alpine and the stipulations make it easier for CPAI to do work in their area.
- They are going on their rivers which go against what was stated before.
- Very large project, too big.
- Multiple residents stated the fish caught today, they are sick, who has the money to the studies that were given to the NSB wildlife because there is no funding, the funding should come from the industry and made available to do the study on the fish

- They are hitting Fish and Judy Creek in Willow Project but they are still feeling impacts from Alpine, GMT1, GMT2
- When they have a new road they have to go far for the caribou, no one is enforcing the 15 MPH when caribou are around, no communications.
- Why is this happening during a pandemic lockdown?
- Great concerns with the processing facility, it's all about the taxation.
- Nanushuk it was denied from Planning Commission, but approved by NSB Assembly.
- Cost of living and hunting is a better option than money from taxation
- Today there are open lakes and rivers are flowing and these permits are being approved by NSB Planning, there is no oversight from the panel.
- There are lawsuits from people who don't even visit the community, using elders' names, some are for development but it needs to be safe development, it is going too fast, need to slow down.
- The only people they see getting jobs are the leadership and no training opportunities for the local residents of Nuiqsut.
- No one is adhering to the stipulations that are in the permits like the high water marks (light props near them and not contained properly and they are fueling up on the lakes.
- The infrastructures are like castles to me.
- Traditional knowledge is never used, NSB would rather use science. Quit playing politics with my subsistence resources.
- Put the shareholders to work.
- If they can hire 3 locals for the same position and split the position to 8 hours a day instead of 12 hours a day, it would give the employee a paycheck and more time to subsist.
- Industry should provide us with work gear, locals have to get their own and when others work they are handed work gear.
- Security needs to get stricter. A lot don't abide by the rules. We see what they do out there; it looks good on black and white but they don't follow the rules.
- Mitigation process, we get funding at the City but they should give separate funds for the Aqpaaq Fund and the Search and Rescue.
- Willow project should be held off until we figure out what's going on in our ecosystem. Opposing the Willow project.
- Need to consider their way of life.
- The demand for oil is not at a high right now, should hold off on this project.
- The caribou may get hurt, we don't know yet. Meltwater pipelines are too low, the caribou can't cross. They should listen and make the pipelines at least 7 feet high so they can cross under.
- Willow rezone is going too fast, when looking at the documents, they are thick, need time to review.
- They do not want any adverse impacts on their environment they want a safe and sound development.

- Development is going too fast, concerned because the school children see the development from their classrooms.
- Concerned that 1.7 million pounds of nitrous oxide has been emitted that causes respiratory issues, the worst of it is that stats of children being affected and concerns that their learning is being impacted, and their development as well.
- The village gets some jobs but it should not be in lieu of their health.
- Money in the pocket is not worth their lives and their health.
- The number of caribous caught has decreased over the years, quite a bit of caribou are getting sick, sent samples in and never hear anything back. Years back there was thousands of caribou all the time and now it's non-existent.
- In the winter time there is green haze above the industry areas but the other way there is none and that haze falls to the ground and the caribou eat that.
- Slow down the process.
- Blasting from the ASRC Mine Site is impacting the fish in the Colville River, and the permafrost changes the ground within the community affecting the infrastructure, there are a lot of water and sewer leaks and breaks, homes becoming uneven.
- Immunological changes not only in people but the wildlife too. We do not have the health facilities to monitor or mitigate their health effects.
- North Slope Borough gets the taxations, but Nuiqsut has to fight for their community monies, they get no funding, it all goes to Barrow.
- Opening up of NPR-A needs improvement, but yet no changes like Barrow. Need to slow down the process because they still haven't seen anything on GMT2 pipeline yet, they want it done right away to benefit their local governments and tribes.
- NSB Wildlife needs to step up with all the funding for studies they get.
- the proposed Willow rezone is huge 350 plus acres of wetlands, processing facilities and three satellites. NSB is on the fast track during this pandemic, people in the village got Covid19.
- Willow hasn't been fully funded yet and it will be funded 3-4 years before its first oil production.
- The North Slope Borough is financially secured, so this project can be held off, it needs to slow down.
- The village is concerned with the impacts they live with, their mitigation needs to be fixed because the impacts are so large. Alpine has 1 Township and Willow will be 7 Townships big.
- Caribou displacement concern, new infrastructure is taking the homes of the wildlife out there.
- Smog and air pollution hurts our children's health today.
- Slow down the development.

- Pandemic going on now world wide.
- Growing up here, seeing their way of life without Alpine because of the Colville River and their way of life.
- Have to hear our leaders repeat over and over at every meeting to slow down the process.
- Nigliq bridge is one of the largest in Alaska.
- Nuiqsut was founded 50 years ago, without land entitlement the NSB would not get the funds they and the 7 villages get funds from ASCR because of Nuiqsut.
- Defer the rezoning until there is progress to determine more mitigation of impacts and their subsistence lifestyle too.
- Too many impacts in their social lives and wildlife and not enough programs to protect them.
- Caught a yellow fish that was bleeding, cannot hunt where they normally hunt because out of the 16 fish caught all of them had sores on them. Sent to NSB Wildlife and was told there was no funding, yet there is NPR-A funding that they receive. The residents consume these fish and no studies done, meaning the residents are eating those fish.
- Losing their subsistence lands to infrastructure.
- Children don't have much.
- The residents want more inspections to see how their daily life is impacted especially the directors who approve these permits, social programs need to come to their community.
- Should consider the article how science got trampled about ANWR. NSB Planning needs to read what the whistleblower who said DOI did not hear from the residents, the permitters and inspectors are responsible for this work.
- Everything is politicized when it comes to development. This is about our subsistence way of life not development.
- Read all the studies, all agencies are fast tracking this project at the expense of Nuiqsut residents, their way of life is being affected, consider the humans more than the wildlife.
- They are prepacking out there even though we still have fish nets out there, there are tuckers out there already.
- Need to think of the residents and slow it down to evaluate the impacts of GMT1 and GMT2.
- Inupiaq from time immemorial are nomadic people and live by the cycle of life which are more important to our territorial wildlife, subsistence lifecycle for harvesting, we depend on it, we know the climate change cycles as well, and the erosion that occurs happened before Alpine, stars were used for travel, the earth tilting was noticed, Inupiaq had always been nomadic, studies need to be done to know how their species have changed so much.
- active subsistence hunter and has two hunting daughters (9&12), they actively subsist to connect to their ancestors, her daughter eats fish every day, they cook and eat subsistence food every day
- one of my children has asthma as well and since eating more subsistence has lowered since the Covid pandemic. slow down from the beginning of the year there is a difference in asthma attacks as before it was more common with industry was running full force.

- With Willow being on the west side it will impact their health because of the green haze in the winters, that haze settles on their land which impacts subsistence, they want their air quality tested.
- This needs to be slowed down because you know it will not stop there, it will go to the south of them as well, hear their cry for their people and children.
- Adaptation cannot be accomplished for their community with industry growing so much, there is no Post Office and no card reader at their fuel station, no freight delivery building, no access to fresh water lake to grow - it is like a can of sardines, professional office space is needed to interact with community and industry they are surrounded by.
- the only way Inupiaq survived was through working together with one another and if everyone would work together including the industry and look at the impacts that divert their way of life it can be done and they will survive, communication is key to work with one another form the federal government to the tribe and the residents, and not only for NUI but all of the NSB villages for generations to come, we are a lost people if we don't have our way of life, we need to know our way of life to be able to move forward as this project will move forward.

December 4, 2020 - Stakeholder Meeting via teleconference:

This was a meeting with Nuiqsut Community Leaders, Department of Wildlife Management, Planning Department staff and CPAI to discuss the rezoning request. Both this meeting and Scoping meeting were held for the benefit of Nuiqsut residents, to give due deference to their comments and concerns.

- Land Administrator gave and overview of the objectives from the rezone process including a timeline of events.
- Notice requirements was only put out less than 72 hours for the scoping meeting, may break ordinances and is unfair all the whilst being amongst the Covid Pandemic.
- Haven't felt the impacts from GMT1 and now GMT2 is still coming along.
- It is a constant issue for the migration for the caribou.
- How can we make comments when we haven't felt the full effects of industry to the East of them, especially during Covid. *Response*- only ordinance we need to follow is for when Planning Commission meets and only bodies of decision making for the public notices.
- Doesn't understand why ConocoPhillips is going into Willow without finishing GMT2 yet.
- Title 19 is the drive for the comp plan to be adopted by the village and this comp plan hasn't been approved yet which drives their local project, so the NSB has no direction from the residents to even move forward with projects.
- The PaisaNich hasn't been approved either and hasn't been brought up with this process, there should not be any approval of permits in their region until these are approved by the assembly. *Response*- The approval from the City of Nuiqsut is moving forward for the resolution and the North Slope Borough has used those documents. (comp. plan and PaisaNich) when doing work for the NSB, in the absence of those the NSB has worked to

their best with local residents to develop the recommendation to the Planning Commission.

- Resources for the residents including the wildlife is more important and we want to know how engaged they are in reflection of the rezone.
- In the past, Alpine was supposed to have only so many flights and they are going against that, with the new airport for Willow and that effects the caribou migration.
- This rezone supports the NSB monetarily but please hear us residents, slow the process down.
- In relations to subsistence, Nuiqsut will be the only people who will be affected by Willow and it's 1/3 bigger then Alpine; the impacts are going to be huge, we rely on subsistence for out daily diet and health, Willow hasn't even gotten full funding but yet they are trying to submit their application for rezone. This is too fast tracked by the North Slope Borough and industry. The NSB is not hurting financially with the taxation, they will not get funds for another 3 to 4 years down the road.
- *Response-* Reclassification of land from conservation to development is needed for them to work on the lands and they cannot get permits until this occurs. When an application comes in the NSB has to process them all in the same manner. permits expire if no work is done for the first 12 months. (gave an example of CD5 permits crossing each other out that occurred). it's good to know the submitted criteria for all permits to follow and the NSB Mayor has to be involved too and per Title 19, the Land Management Administrator has exhausted all extensions they can and there needs to be an amendment to change this.
- Why is NSB doing a rezone when the applicant doesn't even have funds to do the activities in the permits? why can't this be done in portion while they secure the funding needed to ensure it is done right for both parties? *Response-* Title 19 is clear for applications for rezone, all at once and not piece meal a project. Kuukpik as a land owner has a lot of sway in these rezones in lad, title 19 doesn't take in whether or not there is funding secured.
- Willow is in Federal lands and adjacent to Kuukpik lands, they were told Alpine would be a very small footprint 27 years with no other satellite, but in the end GMT1 and GMT2 has more and is a larger footprint, they are running out storage space for their stuff and it will happen again, they are just not feelings the effects of more satellites and GMT1 and GMT2 has no roads yet and then another Willow project comes along and it is a lot bigger than Alpine, 92 some acres back then and now Willow may be up to 3700 acres of land, if Willow goes forward we request no satellites to go up, Kuukpik is landowner for 70,000 acres in the NPRA and adjacent to Willow they are neighbors to us, all of us around Teshekpuk Lake rely on that caribou herd.
- Meltwater pipeline is too low so that is deterring the migration of the caribou and other wildlife.
- Fast track pushing it to the limit.
- Virtually passed, due to Covid-19, Inaugural, new administration, new regulations, pushing it due to a new administration coming in. We need to slow down the process. Fear of the next administration coming on board.

- *Response-* We are obligated to the submittal of an application, if we don't act on it, it will move ahead on it's own.
- NSB Wildlife needs to step up, caribou studies, they need to do the studies now.
- NSB holds the steering wheel that ConocoPhillips turns in for the applicants and this stakeholder meeting is for the hearing of the residents who are effected.
- We try to work with ConocoPhillips but they are rushing, this is an emergency situation, in person public hearing is not allowed, they are wanting to go ahead with Willow rezone, we want to extend it. NPR-A opened and NSB got funds from taxes. We got land management but not on Kuukpik lands, Slow it down.
- *Response-* Due to hunker down order, we got extension to December. our Title 19 is law, we have to abide by it, we can get the NSB Mayor to lift the deadlines.
- Why can't there be an ordinance that says, "no other development until this current project is done"?
- Resident asked if ConocoPhillips had any meetings or conversations with any of the NSB Assembly or the Planning Commissioners regarding Willow rezones or permits?
- *Response-* There were updates to the Assembly the end of August 2020 and the Planning Commission updates were given as well throughout the entire process.
- Are Jim Browdie and Connor Dunn still on? Depiction on the maps on how to narrow down how Willow is; as you move away from oil and gas fields an there are many impacts that will be met as there are long distances from main industry fields; what is the status for the bridge crossing? How many now?
- *Response:* There are 20 crossings.
- Stakeholder asked where is the details of the dams where they begin and end? part of the continuity of communications as you go across the tundra.
- *Response:* the detail will be for the PC meetings and it is in detail of the EIS will be discussed once CPAI is done with their presentation including giving deference to the stakeholders.
- Concern about the new gravel pit, how can the residents get access to gravel for the local residents?
- *Response:* Still working with BLM to secure the gravel including extraction and they will explore options and can't answer the questions just yet. The willow gravel source is farther away from Nuiqsut.
- We have more west winds than east winds now and being surrounded is a huge issue to have industry on both sides of them and they brought this up before without an answer before.
- *Response:* there is a benefit moving farther away from Nuiqsut and prevailing winds are NE and they do understand about it and one thing they are looking at is a small scale of mining technique which is a vehicle gravel miner to mine the gravel seam and to reduce blasting.
- they go hunting where their new Willow and there are displacements of their subsistence hunters as they are moving more west. Concerned they didn't have a meeting with those

villages to the west of them as well.

- air emissions concern, and if there is a new way to monitor he hasn't heard of that, work for the jobs and projects are done by the community contractors within their area and the hiring of residents in the industry
- funding questions about the project from CPAI headquarters and the economical stance of price of oil.
- stated this at scoping meeting last night, but will repeat in front of CPAI today; adaptation is needed while their community is struggling for space and they see campsites and infrastructure going up and the community has very little.
- Comments of lack of support from NSB wildlife and samples of sick animals with the lack of funding to even study the sick wildlife, also the inspections of violations of permits and not penalties given when violations are being spotted by local NSB employees, no consequences of reports for violations as well.
- high grounds of caribou for insect relief which is right at GMT2 and Willow for their migration route onto Teshekpuk for birthing of calves and these is right in their ROW, they are in competition for these types of lands for caribou relief.
- when ice bridges are done there is ice at the bottom of the river that build a wall across the Colville river and it is a concern when they build walls and the fish go through that river for migration and if there is a wall of ice it is impassable for the wildlife and 20 years of this being on the Nigliq Channel is concerning that need to be addressed as wildlife need the ROW for the waterways as it affects the surrounding lakes like Eli is stating,
- what about the impacts to the people and their health issues of the NUI residents, and the mitigation funds don't show the price of a life and the impacts.
- there are a lot of impacts to the residents and we have to encounter the adaptations and there are many more social impacts and they don't have a village counselor and how do they tell the children how the impacts and changing are happening all around them all the time sometimes people get angry about all them and no one is helping them.

19.60.060 Rezoning

Rezonings are changes to zoning district boundaries as shown on the official zoning map. Rezoning application must show compliance with specific provision of NSBMC Title 19. Below are listed the standards for all rezoning applications.

Rezoning Requirements

- Rezoning of an area less than one acre shall not be considered unless the rezoning involves the expansion of an existing zone. Streets or other rights-of-way shall not be included in calculating the minimum area for a rezoning. The area to be rezoned shall be a logical, integrated area. (NSBMC § 19.60.060(B))
- The application, acceptance and notice procedures for a rezoning shall follow the procedures set forth for conditional use in Chapter 19.60. The Planning or Zoning Commission's affirmative recommendations shall be forwarded to the Assembly. (NSBMC § 19.60.060(C))

- The Planning or Zoning Commission as appropriate shall hold a public hearing on the rezoning application. The Planning or Zoning Commission shall approve or disapprove the application or return it to the developer for modification or corrections, based on the requirements of this title, within 60 days of its acceptance by the Administrator, unless the developer consents to an extension of the 60-day period. If the Planning or Zoning Commission fails to act within the 60-day period, the recommendation shall be considered for approval and the application shall be forwarded to the Assembly. (NSBMC § 19.60.060(D))
- The Planning or Zoning Commission shall make a recommendation based on written findings that each of the following criteria have been addressed:
    1. The proposed rezoning must comply with the policies in Chapter 19.70 unless the policies are amended under the provisions in § 19.60.070;
    2. The proposed rezoning is in an area with adequate services, including roads, parking, boardwalks, water, sewer, garbage collection, gas, electricity, drainage, police and fire protection or the developer has agreed to provide all the necessary improvements or services for the area;
    3. The comments from reviewing parties on the proposed rezoning have been adequately addressed;
    4. There is a demonstrated need for additional land in the zoning district being requested;
    5. The resulting district or expanded district will be a logical, integrated area and will not constitute spot zoning; and
    6. An approved master plan is available for the area to be developed. (NSBMC § 19.60.060(E)).

NSBMC 19. 60 & 19.70 Analysis

Based in the information provided by the applicant, CPAI, and the results of the Scoping and Stakeholder meetings, NSB Planning Staff after thorough review will provide a NSB response to each applicable policy. The NSBMC provisions are in **bold**. The responses from CPAI to NSBMC 19.60 & 19.70 are in *italics*, followed by the staff responses are in plain text.

NSBMC 19.60.040 Approval Criteria

A conditional use or development will be granted if all of the standards set forth below are met. The approval shall include a written finding that the proposal can occur consistent with the Borough Comprehensive Plan, can occur harmoniously with other activities allowed in the district and will not disrupt the character of the neighborhood. Such findings and conditions of approval shall become part of the record and the case file.

(A) Policies. The proposal is substantially consistent with the policies of Chapter 19.70.

NSB Response: A staff analysis of Chapter 19.70 is provided as the basis for making the recommendation. The Chapter 19.70 analysis will be labeled CHAPTER 19.70 Borough Policies for ease of review.

(B) Reviewing parties. Consideration has been given to the comments and recommendations of reviewing parties.

NSB Response: No written comments have been received at the time this memorandum was written. The NSB did conduct two meetings with Nuiqsut residents to collect their concerns about this project. The first was the Scoping meeting held in Nuiqsut on August 13, 2018 and the second was a meeting with key Nuiqsut leadership stakeholders, the Department of Wildlife Management, the Planning Department and CPAI in Utqiagvik on September 7, 2018. The purpose of both meetings were to allow Nuiqsut community members and leaders to review the proposed rezoning in detail and account for their comments and concerns, giving them priority.

(C) Villages. For approvals within the villages or their areas of influence, due deference has been given to the opinions of residents of the village and the proposal is in conformance with adopted village plan policies.

NSB Response: Due deference has been given to the concerns of residents of Nuiqsut. There will be further discussion about the application of the Nuiqsut Paisanich as a cultural approach to adapting the development of resource development to the Inupiat way of life on the Colville River.

(D) thru (J) - N/A (Not Applicable)

(K) Historic and cultural resources. Proposals shall not disturb traditional activities or values at historic or cultural sites identified in published studies or by the Commission on Iñupiat History, Language and Culture. The proposed development shall not impact any historic, prehistoric or archaeological resource prior to the assessment of that resource by a professional archaeologist.

NSB Response: comments are provided under NSBMC 19.70.050(E - G) later in this memorandum.

(L) Watershed protection. The proposal shall provide for the conservation of natural features such as drainage basins and watersheds, permafrost stability and the general environment of the area. The proposal shall provide for the protection of watershed areas during and after construction. Conditions of approval shall be designed to minimize or eliminate siltation, road and surface runoff, and pollution of the water supply.

NSB Response: CPAI has sufficiently addressed watershed and drainage concerns for their GMT2 development and continues to monitor and repair their existing roads and facilities to ensure there is adequate environmental protection for Nuiqsut's watershed.

(M) thru (N) - N/A (Not Applicable)

(O) Tundra travel. Vehicles shall be operated in a manner such that the vegetative mat of the tundra is not disturbed and blading or removal of the tundra vegetative cover is prohibited. Snow ramps, snow/ice bridges or cribbing shall be used to cross frozen water bodies to preclude cutting, eroding or degrading of their banks. Snow ramps and snow/ice bridges shall be substantially free of soil and debris and of sufficient thickness to support vehicles. Snow/ice bridges must be removed or breached, and cribbing removed after final use or prior to breakup, whichever occurs first. Frozen water courses shall be crossed at shallow riffle areas, if such areas exist. Where those areas do not exist, an environmentally preferred location will be identified. Vehicles shall not be abandoned. A minimum of six inches of snow or ice on 12 inches of frozen ground is required for tundra travel.

NSB Response: While this rezoning application does not specifically call out Tundra Travel, it will be an inherent part of the construction of the Willow facilities, access roads and pipeline. It is also an integral part of maintaining the rest of the Alpine and associated developments. Staff will work with CPAI to ensure adherence to the NSB regulations on Tundra Travel during construction and field operations.

NSBMC §19.60.060 – REZONING

Rezone area: Is the area to be rezoned at least an acre, or if less, is it expanding an existing rezone? NSBMC §19.60.060 (B).

CPAI Response: Yes. The proposed rezone area consists of 37,654 acres adjacent to the existing Alpine Satellite Resource Development District (RDD). If approved, the Willow RDD would be additive to the Alpine Satellite RDD and expand the overall acreage of the North Slope Borough (NSB)RDD within the National Petroleum Reserve-Alaska (NPR-A).

NSB Response: We concur with the comments offered by CPAI.

Adequate Services: Are there adequate services, including roads, parking, boardwalks, water, sewer, garbage collection, gas, electricity, drainage, police and fire protection, or has the developer has agreed to provide all the necessary improvements or services for the area? NSBMC §19.60.060 (E)(2).

CPAI Response: Yes. Where there is currently no permanent infrastructure with the proposed rezone area, the developer, ConocoPhillips Alaska, Inc. (CPAI) proposes to establish all necessary improvements and/or services, as described in the Willow Development Master Plan (Master Plan). This includes access roads; work vehicle parking and equipment staging areas; utilities (water, wastewater, gas, electricity, and waste management); infield security, fire protection, and emergency medical treatment services; and other municipal type functions.

NSB Response: We concur with CPAI's response. : We agree with the CPAI statement of adequacy of services, but there were Nuiqsut concerns raised about solid waste handling in the Colville Delta and the adequacy of those facilities. At some point soon, the NSB, BLM and CPAI will need to

address solid waste handling and disposal. Working together a modern, more appropriate solution to solid waste handling should be adopted.

Demonstrated need: Is there a demonstrated need for additional land in the zoning district being requested? NSBMC§ 19.60.060 (E)(4).

CPAI Response: Yes. CPAI has demonstrated the need for rezoning the proposed Willow RDD by: (1) securing oil and gas leases, (2) conducting approved exploration and appraisal activities, (3) determining that oil and gas resources can be economically recovered and (4) designing oil and gas development infrastructure and facilities. The proposed Willow RDD includes areas that will support the Willow Development project (Project) infrastructures and activities.

NSB Response: We concur, CPAI's statement about the adequacy of the amount of land requested for this rezoning. We have also worked with CPAI to verify the current zoning status on existing lands with the RDD zoning designation.

Spot Zoning: Will the expanded zoning district be a logical, integrated area that will not constitute spot zoning. NSBMC §19.60.060 (E)(5).

CPAI Response: Yes. The proposed Willow RDD is adjacent to the existing Alpine Satellite RDD, along its western and southern borders. Rezoning the additional area would integrate the proposed Willow RDD with the existing NSB RDD. The expanded district would be a logical, contiguous area that supports similar land uses and activities.

NSB Response: This request does not constitute spot zoning. CPAI proposes a logical and integrated and minimum rezoning.

Master Plan. Is there an approved master plan or was one submitted as part of the application? NSBMC §19.60.060 (E)(6).

CPAI Response: Yes. The proposed Master Plan is included in this application package.

NSB Response: CPAI has submitted a consolidated masterplan for the Willow Rezone.

NSBMC CHAPTER 19.70: - BOROUGH POLICIES

The policies in NSBMC Chapter 19.70 are applicable to the approval of all development and uses within the Borough. Economic development and area-wide policies are applied to all lands and waters within the Borough boundary. Village, Coastal Management and Transportation Corridor policies are applied to approvals within their respective areas.

§ 19.70.020 - VILLAGE POLICIES.

The following policies are intended to guide the approval of development and uses in the village districts:

Village Policies. Is the project consistent with all applicable village plans or policies? NCBMC§19.70.020 (A-B).

CPAI Response: Yes. The Project is within the NSB Area of Influence, Nuiqsut Village Area of Influence, and Anaktuvuk Pass Area of Influence. The Project has been evaluated for consistency, including the zoning and land use provisions, and found to have no conflicts with the applicable plans: North Slope Borough Comprehensive Plan 201-2039, Final Draft Nuiqsut Comprehensive Plan (2015-2035) (NSB2016a), and the Final Anaktuvuk Pass Comprehensive Plan 2016-2036 (NSB 2016b).

NSB Response: The NSB Area of Influence is Nuiqsut.

Employment: Will the project provide local employment for Borough residents? NSBMC §19.70.020(D) and §19.70.030(B)

CPAI Response: Yes. CPAI has an active workforce development program committed to hiring Kuukpik shareholders, Nuiqsut residents, North Slope residents, and Alaska Natives. Local resident hiring in Nuiqsut is coordinated with Kuukpik Corporation to identify and place qualified individuals interested in working on CPAI projects. CPAI also provides funding for a local employment coordinator position with Kuukpik Corporation.

NSB Response: NSB encourages local employment opportunities for NSB residents that express an interest in work. The construction of the Willow site by CPAI has significant opportunities to employ local residents with trades such as Welding, Heavy Equipment Operators, Laborers, and Mechanics from within the North Slope and can also provide opportunities to participate at a contractor level. Additionally, the operational needs of Willow may provide additional opportunities on maintenance throughout the production life of Willow. The NSB will require regular employment reporting to monitor the CPAI hiring policies and practices regarding NSB residents.

§ 19.70.030 - ECONOMIC DEVELOPMENT POLICIES.

Flexibility: Will flexible employment procedures allowing for subsistence leave be used? NSBMC § 19.70.030(C).

CPAI Response: Yes. Due to the nature of CPAI's development work, local residents are provided with opportunities to work on a seasonal basis, affording them the option to pursue subsistence activities during the off-work seasons. Additionally, rotational schedules and shift work (typically two weeks on, two weeks off) also gives residents the opportunity to subsistence hunt and fish during their time off during employment.

NSB Response: Subsistence is the way of life on the North Slope. Subsistence is defined according to Title 19 as an activity performed in the support of the basic beliefs and nutritional needs of the residents of the Borough and includes hunting, whaling, fishing, trapping, camping, food gathering, and other traditional and cultural activities.

The NSB supports NSB resident employment with CPAI and its contractors that provide NSB residents the opportunity to gain experience and expertise on a long term basis. There should be no difference in employment conditions for NSB residents than those employment conditions offered at CPAI and its contractor employees. It is unacceptable to relegate NSB residents to seasonal position only to address subsistence pursuits.

Training: Will job training programs be provided for Borough residents? NSBMC § 19.70.030(D).

CPAI Response: CPAI and its contractors assist with scholarships, career training, and internship opportunities to further expand local workforce capabilities and ensure that local residents are hired and retained. We work closely with our contractors to provide training, apprenticeship and internship opportunities for local residents to prepare for full-time positions in the oil and gas industry. As the programs are completed, individuals are considered for full-time employment if positions are available. If positions are not currently available, CPAI and its contractors maintain records of individuals who have completed the various programs for consideration of potential future employment opportunites.

NSB Response: NSB emphasizes contracting with the North Slope contractors. Training is always available and the training can be beneficial when it is utilized in a way that supports employees and/or residents pursuit of credentials to work in a higher up position. CPAI has indicated within their application, the intent to utilize the training programs for shareholders of Arctic Slope Regional Corporation (ASRC), Kuukpik and UIC Corporations. The training programs include on the job training for field-based positions including all areas of operations and construction operations. New hires are assigned to mentors who assist in training and guidance. Trained employees are primary candidates for CPAI operator hires.

Suppliers: Will local suppliers or subcontractors be used? NSBMC§19.70.030 (A)

CPAI Response: Yes. CPAI recognizes the importance of doing business locally and strives to procure goods and services from local Alaskan businesses whenever possible. CPAI is committed to giving local contractors and suppliers the opportunity to participate in its projects through competitively bidding contracts where appropriate. This strategy has been successful in awarding a substantial number of contracts to local and Native-owned businesses. CPAI maintains local offices in Nuiqsut and Utqiagvik and has staff dedicated to maintaining relationships in North Slope communities. CPAI's Economic Development Plan (EDP) details programs, scholarships, and employment and procurement process in place to encourage local employment opportunities. Consideration will be given to qualified suppliers and subcontractors within the NSB for work, which can be accomplished through a competitive bidding process.

NSB Response: NSB supports and encourages CPAI to use local suppliers and contractors.

Arts: Will uses/developments directly relate to or encourage Inupiat arts and crafts? NSBMC§19.70.030(E).

CPAI Response: CPAI's operations do not directly relate to Inupiat arts and crafts. However, Nuiqsut residents are provided opportunities to sell arts and crafts to CPAI employees and our contractor's employee lodging at Alpine and at the Kuukpik Hotel in Nuiqsut. CPAI personnel and CPAI contractor's employees who visit North Slope communities often purchase local arts and crafts.

NSB Response: NSB supports Inupiat Arts and Crafts made by local artists. The NSB encourages the applicant to consider Inupiat arts and crafts for display in its facilities and offices that reflect local art, when opportunities arise. CPAI offers opportunities for sale of Inupiat arts and crafts at its Alpine and associated developments.

Local Energy. Will uses/developments use locally obtained energy? NSBMC§19.70.030(F).

CPAI Response: Yes. CPAI utilizes locally obtained and produced natural resources in its construction and operations activities on the North Slope.

NSB Response: We concur with CPAI's response. While the natural gas supplied to Nuiqsut has greatly reduced dependence on diesel fuel.

Low-Cost Energy: Will uses/developments contribute to a lower-cost fuel or power? NSBMC §19.70.020(C).

CPAI Response: No. Willow will not directly contribute to lower-cost fuel or power beyond what is currently provided. For background, CPAI provides up to one-million cubic feet of natural gas per day to the community of Nuiqsut at no cost per contractual agreements with Kuukpik. Gas deliveries started in 2008, after construction of the Nuiqsut gas Pipeline and natural gas infrastructure in the village by the North Slope Borough (NSB). This infrastructure is operated and maintained by the NSB and the Natural Gas Cooperative. Ninety-nine percent of Nuiqsut households are now connected to natural gas and Nuiqsut enjoys some of the lowest energy bills in the nation ($25.00/month for gas). This frees up the household budgets to participate in subsistence activities and provide for families.

NSB Response: We concur.

Revenue: Will uses/developments generate tax revenues that exceed NSB's expenditures on these developments/uses? NSBMC§19.70.030(G).

CPAI Response: Yes. CPAI's oil and gas exploration, production, and construction, activities generate tax revenues for the NSB and the State of Alaska. In addition to NSB property tax, finding and developing additional oil fields provide revenue and benefits to the NSB in the form of jobs, increased infrastructure, education funding and to Kuukpik and ASRC Shareholders in

the form of royalties and dividends. Federal revenue (sales, rentals, bonuses, and royalties) associated with the Project contribute to the NPR-A Impact Mitigation grant program.

The NPR-A Impact Mitigation Grant fund is mandated by Congress. Under federal law adopted in 1980, 50% of the money received from "sales, rentals, bonuses, and royalties" from the NPR-A must be paid to the State specifically to be used as follows: "for (a) planning, (b) construction, maintenance and operation of essential public facilities, and (c) other necessary provisions of public service: Provided further, [t]hat in the allocation of such funds, the State shall give priority to use by subdivisions of the State more directly or severely impacted by development of oil and gas leased under this Act." To date, this program has contributed over $150 MM to NSB communities of Nuiqsut, Atqasuk, Wainwright, Utqiagvik, and Anaktuvuk Pass. The Project has the potential to contribute hundreds of millions of dollars of federal royalty during the life of the field. The actual amount will depend on wells drilled, production, price, and other variables.

NSB Response: It is anticipated that this development will generate local tax and other revenues in excess of the NSB's expenditures on this development.

§ 19.70.040 – OFFSHORE DEVELOPMENT POLICIES.

Not Applicable.

§ 19.70.050 - COASTAL MANAGEMENT AND AREA-WIDE POLICIES.

The Borough has developed these policies that identify general and specific courses of action to achieve region-wide Comprehensive Plan goals and the implementation of its Coastal Management Program. The policies in this section are a guide for the actions and programming of agencies and organizations currently active or anticipating development activities anywhere in the Borough. All development and uses must comply with each of the policies set out in this section unless the Administrator finds that the policy is not applicable.

Demonstrated Need: Is there is significant public need for the proposed use and activity? NSBMC § 19.70.050(J)(1).

CPAI Response: Yes. Development will provide benefits to local, State, and national economies through local hire for jobs created during construction and operations, tax revenues, revenue sharing, royalties, and new resources to help meet U.S. domestic energy demands.

NSB Response: We concur with CPAI's statement

Will the project avoid depleting subsistence resources below the subsistence needs of the local residents of the Borough? NSBMC §19.70.050 (A).

CPAI Response: Yes, CPAI acknowledges the importance of ensuring that development projects do not deplete subsistence resources. Many aspects of the Project design and many of the associated mitigation measures are adopted specifically to protect subsistence resources.

Examples include an optimized gravel footprint to limit habitat disturbance, road and pipeline layouts that avoid a corralling effect on caribou, and fluid storage and transfer measures that protect against contamination. For decades, CPAI has funded scientific studies on subsistence resources such as whitefish and caribou to ensure good data are available for permitting, operations and other purposes. Using this and other data, the BLM and cooperating agencies (including the North Slope Borough) considered potential effects of the project on vegetation, fish, birds, mammals in the Willow MDP Final Environmental Impact Statement (FEIS). The FEIS does not find that the Project would cause depletion of subsistence resources.

NSB Response: We concur with CPAI. In addition, please see the stipulation and mitigation measures below.

19.70.050 (B) - (C) Not Applicable

Will the project avoid precluding reasonable access to subsistence resources? NSBMC §19.70.50 (D).

CPAI Response: Yes. CPAI avoids precluding access to subsistence resources through both Project design and proposed operational measures. Nuiqsut residents and Kuukpik shareholders may use CPAI-operated gravel roads and ice roads in the Kuukpik Withdrawal Area. This increases the travel opportunities for access to subsistence resources. For roads outside the Kuukpik Withdrawal Area, all North Slope residents may use CPAI-operated gravel roads and ice roads consistent with current safety policies. The Project access road has been designed to include eight subsistence access ramps and vehicle pullouts that allow users to cross the road safely in order to access the areas on either side.

CPAI has developed processes to consult with subsistence users regarding planned oil and gas activities, including by employing local Subsistence Representatives and Ice Road Monitors on the ground who can advise on how to avoid interfering with subsistence activities. CPAI has improved the effectiveness of its ice road cleanup program to reduce helicopter flights for stickpicking and established a daily call-in service to share updates on aircraft activity. Flights associated with the Project will be farther away than the existing operations; however, CPAI will continue to coordinate helicopter-based studies with other users when possible. These coordination protocols which have been developed in cooperation with North Slope residents and stakeholder groups to minimize impacts on subsistence use and access, will be adopted as part of the Project.

As an additional voluntary mitigation, CPAI has committed to building up to three boat launches to provide subsistence access- pending community feedback regarding location and overall support- at the Tinmiaqsiugvik River Bridge (existing), Judy Creek and Fish Creek. By creating road access to a boat launch, the Project will increase access to subsistence resources in river corridors.

BLM's ANILCA Section 810 Analysis states that, "The totality of limitations on subsistence access associated with the Project, particularly during the 7-year construction phase but lasting

through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents." This finding is largely based on an expectation that hunters will avoid hunting near Project infrastructure, and that such avoidance constitutes a restraint on access. CPAI believes that BLM has overstated the potential impacts, minimized the countervailing benefit of hunters using the roads, subsistence access ramps, and boat launches to access the BTU area. BLM itself acknowledges further in the FEIS that, "None of these impacts is expected to affect all subsistence hunters equally, and many of these impacts are uncertain." (FEIS, Appendix G, ANILCA Section 810 Analysis, page 25).

Nuiqsut subsistence hunters will have access to the roads to hunt and subsistence ramps and pullouts will be provided; the Willow project will not preclude access to subsistence resources.

NSB Response: While we agree with CPAI's statement, we believe there is a greater need for studies. Please see the stipulations and mitigations measures below.

Will the project avoid depleting the productivity of subsistence resources and their ecosystems? NSBMC §19.70.050 (J)(3)(a).

CPAI Response: Yes. CPAI avoids depleting the productivity of subsistence resources and their ecosystems through measures incorporated into the Project planning, design, and operations, which were and will continue to be informed by environmental studies. CPAI implemented an ecosystem-wide approach to collecting baseline data.

Baseline studies include:

- *15+ years of caribou surveys*
- *4 years of Yellow-billed loons surveys for nesting and brood production*
- *4 years of aerial pre-nesting Spectacled eider surveys*
- *4 years of fish stream crossing surveys to examine seasonal distribution and composition of fish populations*
- *Habitat mapping, wetlands classification, and sensitive plants identification*
- *4 years of hydrology monitoring for stream crossings*
- *Marine water quality sampling*
- *Marine Bathymetry*
- *Harrison Bay nearshore fish abundance and species composition*
- *On-water pinniped surveys*
- *Funded additional ASAAM Survey transects*
- *Aerial imagery and LiDAR collected in 2018*
- *Winter engineering studies for Ocean Point*

The information collected was used to inform the Project engineering and design, including how to minimize environmental impacts, consistent with land use and permitting requirements. The information was also used for analysis of productivity in the FEIS, especially in Section 3.8

(Water and Water Resources) and Section 3.9 (Wetlands and Vegetation). Hydrologic flow and connectivity will be maintained by bridges and culverts. Animal movement will be facilitated by 7-foot height requirements on pipelines, and the abundance of caribou is not expected to be impacted by the project (FEIS Section 3.16.2.3.1). In FEIS Section 3.12 (Terrestrial Mammals), the potential for habitat disturbance and impact on caribou is recognized, particularly in Section 3.12.2.3.1 (FEIS Page 175). Recognizing the limited habitat disturbance in context, the following conclusion is reached: "Because the habitats lost are not unique and occur throughout the analysis area and the ACP [Arctic Coast Plain], caribou would likely move to similar habitats bearby." See Supplement D, Willow Development Project Avoidance and Minimization Measures for an extensive list of how CPAI proposes to avoid, minimize, and mitigate impacts, thereby avoiding the depletion of subsistence resources and their ecosystems.

NSB Response: Please see the stipulations and mitigations measures below.

Has the project identified all cultural or historical sites, including sites where traditional activities take place? NSBMC §19.70.050(E).

CPAI Response: Yes. CPAI retains the services of professional archaeologists and cultural anthropologists, who identify cultural and historical sites and confirm the location(s) of documented traditional land use areas and cultural artifacts within the proposed project area. These data have a limited distribution to maintain the integrity of the area(s), with submittal of this information to the Alaska Department of Natural Resources (ADNR) Office of History and Archaeology, the Inupiat History Language and Culture (IHLC) Commission and Traditional Land Use Inventory (TLUI) and the local Native village leadership. Formal coordination and consultation with the State Prehistoric Preservation Office/r (SHPO) through the ADNR Office of History and Archaeology (OHA), BLM and the NSB IHLC TLUI office/coordinator and Planning Department will be conducted for new projects prior to construction. The NSB, State and local entities will be notified immediately if prehistoric, historic or archaeological objects are discovered during construction or operations.

NSB Response: We concur with CPAI's statement.

Will the project avoid interference with cultural or historical sites, including sites where traditional activities take place? NSBMC §19.70.050(F), §19.70.050(G).

CPAI Response: Yes. CPAI's project will be modified as needed to avoid impacting any identified areas of cultural significance from cultural resource studied and clearances discussed above. Federal, state, and local entities including NSB, will be notified immediately if prehistoric, historic, or archaeological objects are discovered during the proposed project.

NSB Response: We concur with CPAI's statement.

Air and Water Quality Protection: Will development comply with state or federal land, air and water quality standards? NSBMC §19.70.050 (H), §19.70.050 (I)(3).

CPAI Response: Yes. CPAI will secure the appropriate State and Federal permit authorizations and comply with all terms and conditions, including land, air and water quality standards.

Federal: The Bureau of Land Management (BLM) has developed land use standards that are described in the NPR-A Integrated Activity Plan (IAP) and will be applied to permit authorizations for the Project. The Project has been designed to be consistent with existing Best Management Practices (BMP) with few waiver requests, for which CPAI has proposed an alternative mechanism for achieving the objective of the BMP.

State: The Alaska Department of Environmental Conservation (ADEC) has primacy for regulating air and water quality. The Project has been designed so that air emissions do not exceed the Alaska Ambient Air Quality Standards (AAAQS); ambient air quality monitoring measurements are collected regularly form a monitoring station in Nuiqsut. CPAI has submitted an antidegradation analysis describing how the Project will meet water quality standards under Section 401 of the Clean Water Act. Surface water discharges will be monitored per the Alaska Pollutant Discharge Elimination System (APDES) permit; CPAI will develop and operate according to an approved Storm Water Pollution Prevention Plan (SWPPP).

NSB Response: There continues to be community concerns about air quality in Nuiqsut. Community members and stakeholders alike mention what they perceive to be deteriorating air quality in the community. To that end, we require:

- CPAI continue its analysis of the data obtained from its air quality monitoring station in Nuiqsut and the station installed at CD4 in 2009 to evaluate incremental changes in air quality in the Nuiqsut area.
- CPAI seek EPA guidance and conduct accepted air National Ambient Air Quality Standards (NAAQS) attainment demonstration modeling that will integrate and take into account its monitoring data regarding criterion pollutants including PM2.5 when appropriate models are available.
- Prior to drilling, CPAI provide a detailed plan, using commercially reasonable means, to mitigate the risk of Clean Air Act violations or harm to the public health.

Noise Mitigation: Will vehicles/vessels/aircraft avoid disturbance of areas where noise-sensitive species are concentrated at times when such species are concentrated? NSBMC §19.70.050 (I)(1).

CPAI Response: Yes. CPAI uses mufflers to abate noise from exhaust systems of engines. Additionally, CPAI aircraft, when flying over BLM lands, must abide by the measures set forth in the National Petroleum Reserve-Alaska (NPR-A) Final Integrated Activity Plan/Environmental Impact Statement (BLM 2012), particularly Best Management Practice (BMP) F-1 which

establishes a minimum flying altitude of 1,500 feet to minimize the effects of low-flying aircraft on wildlife. To the extent practicable, all CPAI aircraft would maintain an altitude greater than 1,500 feet, excluding takeoffs and landings, from caribou and muskoxen concentrations. A concentration means numbers of animals more than the general density of those animals found in the area. Lastly, CPAI will avoid harassment of nesting bird species and remain outside of the buffer zone.

NSB Response: CPAI has shown willingness to adjust their aircraft and other noise sources based on the concerns raised by community members.

Will industrial and commercial development be served by solid waste disposal facilities that meet state and federal regulations? NSBMC §19.70.050(I)(4).

CPAI Response: Yes. Food wastes would be incinerated on site or at Alpine or, if non-burnable, will be recycled or transported to a landfill facility at Deadhorse, Fairbanks, or Anchorage. Hazardous and other solid wastes associated with the Project will be managed under Alaska Department of Environmental Conservation and U.S. Environmental Protection Agency (EPA) regulations, BLM, BMPs, and the NSB Municipal Code, where applicable.

NSB Response: While we concur with CPAI's statement, the real issue at hand is the increasing distance from of the Deadhorse Regional Landfill and the need to create a new solid waste disposal facility closer to the new oil developments that are occurring and will continue to the West of the Colville River. The disposal methods that were used in the early days of Alpine are too limited to address the growing solid waste disposal needs of this region of the North Slope and as such, CPAI needs to engage the NSB and BLM on developing a regional solid waste solution for the Greater Colville area.

If the development is not on a central sewage system, will a facility be installed to impound and process effluent to meet state and federal quality standards? NSBMC §19.70.050(I)(5).

CPAI Response: Yes, Domestic Wastewater treatment infrastructure will be located at the Willow Operations Center (WOC) Sanitary wastes generated from the various camps will be hauled to the wastewater treatment facility. The treated wastewater will be disposed of in the Underground Injection Control Class I disposal well located at the WOC, hauled to and disposed of at another approved disposal site, or, in an emergency, discharged under Alaska Pollutant Discharge Elimination System (APDES) General Permit AKG332000.

NSB Response: We concur with CPAI's statement.

NSBMC 19.70.050(I)(6-10) - Not Applicable

Will impermeable lining and dikes be installed for all oil and fuel storage facilities with a capacity of 660 gallons or larger? NSBMC §19.70.050(I)(11).

CPAI Response: Yes. Fuel and oil storage will comply with local, State and Federal oil pollution prevention requirements, according to an Oil Discharge Prevention and Contingency Plan (ODPCP) and Spill Prevention, Control, and Countermeasure (SPCC) Plan. Secondary containment for fuel and oil storage tanks will be sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR Part 112. Fuel and chemical storage associated with the Project will be managed under BLM BMPs.

NSB Response: We concur with CPAI's statement, contingent upon the Oil Discharge Prevention and Contingency Plan (ODPCP) and Spill Prevention, Control, and Countermeasure (SPCC) Plan.

Are uses and developments that could impact water quality (such as hazardous materials and waste storage) at least 1500 feet from water bodies? NSBMC §19.70.050 (J)(3)(d).

CPAI Response: Yes. Hazardous materials and waste are planned to be stored at least 1,500 feet from any waterbody.

NSB Response: We concur with CPAI's statement. The NSB will require refueling of any kind that occurs within 1500 feet of a waterbody will be done by two trained fuel technicians, after appropriate absorbent pads and drip pans have been placed.

Will transportation facilities, including pipelines, avoid obstructing wildlife and allow wildlife? NSBMC §19.70.050 (J)(3)(f). and §19.70.050(L)(5).

CPAI Response: Yes. Transportation facilities, including roads and pipelines, have been configured to avoid obstructing wildlife. All Project pipelines will parallel gravel roads, when possible, typically at a distance from the roadways of 500 to 1,000 feet, which will facilitate routine visual observation and investigation of pipelines. Pipelines will rest on common horizontal support members, atop vertical support members (VSMs) placed approximately 55 feet apart and will be a minimum of 7 feet above ground (including any suspended cables). The Project pipelines have also been designed to avoid VSM placement in streams.

NSB Response: We concur with CPAI's statement.

Will transportation facilities and utilities be consolidated to the maximum extent possible to avoid duplication? NSBMC §19.70.050 (J)(3)(h).

CPAI Response: Yes. The Project has been designed to consolidate transportation facilities and utilities to the maximum extent possible to avoid duplication. The proposed gravel airstrip will support air traffic for the entire field and will be of sufficient length to accommodate Bombardier Q400 aircraft, which are capable of carrying more passengers that the Twin Otter or CASA, which have historically been the aircraft used for crew change out of Alpine. CPAI's acquisition of the Q400s consolidates crew change flights and reduces the overall number of fixed winged aircraft flights by 50%. The Willow Central Processing Facility (WCF) will process all produced

fluids and feature a power plant that delivers power to each drillsite. Water and wastewater treatment will be conducted at the WOC.

NSB Response: Anything that is not shown on the approved master plan for Alpine and associated developments, especially ice roads that require development permits, will be closely scrutinized to ensure reasonable efforts are made to use existing facilities.

Does the project avoid mining on beaches, barrier islands or offshore shoals or demonstrate that no feasible and prudent alternatives exist? NSBMC §19.70.050 (J)(3)(i).

CPAI Response: Yes. CPAI avoids mining on beaches, barrier islands, and offshore shoals by using the proposed Willow mine sites, which are located onshore southeast of Greater Mooses Tooth One/Mooses Tooth 6 (GMT1/MT6).

NSB Response: We concur with CPAI.

Does the project avoid placement of structures in floodplains subject to a 50-year recurrence level and in geological hazard areas? Or has applicant demonstrated that no feasible and prudent alternative exist? NSBMC §19.70.050 (J)(3)(j).

CPAI Response: Yes, CPAI can demonstrate that no feasible and prudent alternative exists to locating a portion of the support infrastructure (i.e. pipeline and gravel pipelines pad) within the Colville River floodplain. Drillsite pads must be located within the area of the reservoir; however the Project features an overall reduced gravel footprint by using horizontal directional drilling technology to access the reservoir.

NSB Response: We concur with CPAI's statement.

Will development be located, designed and maintained so as to prevent significant adverse impacts on fish and wildlife and their habitat, including water circulation and drainage patterns and coastal processes? NSBMC §19.70.050 (R)(2).

CPAI Response: Yes. CPAI redesigned the Project in response to concerns about how the proposed Offshore Staging Area, a temporary gravel island used for module delivery and transportation, would affect coastal processes and marine subsistence species. Instead, CPAI will utilize the existing gravel road network from Oliktok Dock and ice roads for module haul to minimize potential impacts. See Supplemental D, Willow Development Project Avoidance and Minimization Measures for an extensive list of how CPAI proposes to prevent significant adverse impacts on fish and wildlife and their habitat, including water circulation and drainage patterns.

NSB Response: Key to accepting this provision will be the implementation of the wildlife, water bird and fish studies earlier specified in this memorandum to verify there continues to be no significant adverse impacts.

Will resource extraction support facilities, including administration offices, operations, residence, and other uses not absolutely required in the field be located in a designated service base which is sited, designed and constructed and maintained to be as compact as possible and to share facilities to the maximum extent possible? NSBMC§19.70.050 (R)(3).

CPAI Response: Yes. The WOC will serve as a designated service base and has been designed to minimize the overall footprint of the WOC pad while maximizing facilities sharing to the extent possible. See also response to 7D.

NSB Response: We concur with CPAI's statement.

Will transportation facilities and utilities be consolidated to the maximum extent possible to avoid duplication? NSBMC §19.70.050 (K)(6).

CPAI Response: Yes. Transportation facilities and utilities are consolidated to the maximum extent possible. See also response to 7D.

NSB Response: While we concur with CPAI's statement, the NSB is working on seasonal snow trials and encourage CPAI cooperation to minimize duplication of trials in the best interests of all residents.

Will development be located, designed and maintained in a manner that does not interfere with the use of a site that is important for significant cultural uses or essential for transportation to a subsistence use area? NSBMC §19.70.050 (K)(8).

CPAI Response: Yes. CPAI does not limit the use or crossing of CPAI roads for subsistence use by local residents. Additionally, CPAI has added vehicle pullout pad locations that provide safe locations for subsistence hunters to park their vehicles and trailers while they hunt, while still allowing for safe industrial use of the road. These pullouts include ramps to facilitate access to essential subsistence use areas. See also response to 3.A.

NSB Response: We received concerns from stakeholders that:

- Industry employees are not adhering to the 15 mile per hour speed limit required when wildlife is in the vicinity.
- Industry employees are honking at caribou when near them.

Will siting, design, construction and maintenance of transportation and utility facilities (including ice roads) minimize alteration of shorelines, water courses, wetlands and tidal marshes? NSBMC§19.70.050 (L)(2).

CPAI Response: Yes. CPAI has designed the proposed project components to has as little gravel fill as is reasonably possible to have minimal impacts to wetlands. CPAI walks the entire route of each development to determine the locations of culverts to sustain sheet flow within the area. Where possible, CPAI's infrastructure is placed a minimum of 500 feet away from the shoreline

of a waterbody. Existing gravel facilities will be utilized to the extent possible to minimize the additional gravel footprint and associated support infrastructure.

NSB Response: We concur with CPAI's statement.

Will siting, design, construction and maintenance of transportation and utility facilities (including ice roads) minimize significant disturbance to important habitats and avoid critical fish migration periods? NSBMC §19.70.050 (L)(2).

CPAI Response: Yes. Siting, design, construction and maintenance of transportation and utility facilities (including ice infrastructure) will minimize significant disturbance to important habitats and avoid critical fish migration periods. Bridges are specified for river crossings other than the Colville River, and the single-season ice-bridge across the Colville River will not occur during a critical fish migration period.

NSB Response: We concur with CPAI's statement.

Will the project maintain the natural permafrost insulation quality of soils and vegetation? NSBMC§19.70.050 (L)(3).

CPAI Response: Yes. CPAI designed its infrastructure to maintain the thermal regime of the permafrost soils by ensuring that all roads and pads are designed with a minimum five-foot thickness gravel fill.

NSB Response: CPAI's plans shows that they will construct this development with an appropriate amount of gravel to protect the permafrost.

Will airports and helicopter pads be sited, designed, constructed and operating in a manner that minimizes impact on wildlife? NSBMC§19.70.050 (L)(4).

CPAI Response: Yes ConocoPhillips will comply with BMPs that are crafted to minimize the effects of air traffic on wildlife.

NSB Response: We concur.

Will pipelines be situated and sufficiently high (7 feet preferred, 5 feet required) to avoid interference with wildlife movement? NSBMC §19.70.050(L)(5).

CPAI Response: Yes. Pipelines will be designed with sufficient height to avoid interference with wildlife movement. New pipelines will be supported on common VSMs placed approximately 55 feet apart and would be a minimum of 7 feet above ground surface. Where possible, pipelines would be constructed at least 500 feet away from the road to minimize caribou disturbance and prevent excessive snow accumulation. Pipelines are typically constructed within 1,000 feet of roads to allow for visual inspection from the road.

NSB Response: We concur with CPAI's statement.

Is the project sited, designed and constructed to minimize loss of life or property due to riverine flooding, icings, stream bank erosion, oceanic storms, sea waves, ice gouging and override and shore erosion? NSBMC §19.70.050 (L)(6).

CPAI Response: Yes. CPAI designs all projects to withstand a 50-year flood. CPAI will continue to follow the Alpine Facilities Erosion Control Plan and the Willow Development Erosion Plan, which is currently approval.

NSB Response: We concur with CPAI's statement.

STAFF RECOMMENDATION:

Staff's recommendations are intended for the Planning Commission's review for the proposal and to help inform prior to the Public Hearing.

Staff believes CPAI's proposed development has met the approval criteria for this development and recommends that the Planning Commission recommend approval of this rezoning to the Assembly, subject to the Stipulations and Mitigation Measures listed below. Additional stipulations maybe added by the Planning Commission, if not already addressed in this memorandum.

STIPULATIONS AND MITIGATION MEASURES

Willow Final Staff Recommendation Stipulations and Mitigation Measures

1. **Overall Impact Minimization**

   A. Duck Ponds: CPAI and its contractors shall place or affix permanent ownership identification and unique numbering on every duck pond owned and used.

   B. Mitigation Fund: CPAI shall mitigate the impacts on local residents related to the additional infrastructure in the area and the potential for reduction of subsistence resource availability, including the impacts related to displacing resources from high priority subsistence use areas. Commencing with the start of construction and continuing for the life the project, in addition to any other agreements CPAI shall make annual payments in the amount of $50,000 per year to a mitigation fund directed and administered by the North Slope Borough.

2. **Subsistence Use Protection**

A. Access: CPAI shall consult with the NSB, the Native Village of Nuiqsut, Kuukpik Corporation, and the Kuukpik Subsistence Oversight Panel (KSOP) at least annually. Examples of uses and developments requiring consultation include but are not limited to the following: (1) construction of facilities and roads; (2) aircraft movement; (3) drilling; and (4) the selection of water sources. Through this consultation, CPAI shall make reasonable efforts to assure that planned activities are compatible with subsistence activities and will not result in unreasonable interference with subsistence harvests or subsistence resources. CPAI shall submit a report of this consultation, including areas of agreement and identification of any unresolved conflicts, to the Administrator prior to the commencement of the uses/developments at issue. The Administrator may take measures consistent with NSBMC Title 19 to address any unresolved conflicts relating to said uses/developments.

B. Due Diligence: CPAI shall exercise due diligence to mitigate all adverse impacts on subsistence use activities caused by CPAI's activities.

C. Timing: To the maximum extent practical, initial project construction activities, such as construction of gravel roads, pad, pipeline and bridges, will be done during the winter season.

3. **Wildlife and Habitat Protection**

A. General Provisions for studies on caribou, waterbirds, fish and subsistence:

The following provisions apply to the caribou, waterbird, subsistence, and fish stipulations.

a. Study designs will be discussed and coordinated with the NSB Department of Wildlife Management (DWM) for submittal to the NSB by 1 March 2021 and each year thereafter as necessary. The DWM and Planning will review, seek revisions as appropriate, and approve the study designs by 1 April 2021 and each year thereafter as necessary.

b. An annual report will be prepared and distributed to NSB DWM and Planning departments by 15 February and a meeting scheduled with NSB DWM and Planning, to occur by 1 April. This meeting will discuss the results and the potential need for adjustments to scope to assess possible impacts to caribou, waterbirds, fish, and subsistence users. The Land Management Administrator and Director of the DWM will make the final decision of whether study designs need to be altered and/or additional data collection or analyses are required.

c. CPAI will consult with KSOP on study design prior to submittal to the NSB and provide KSOP with annual reports.

d. CPAI will make data available from their studies annually to the NSB DWM and within a year of completion of the study to the general public through a data archive (e.g., UAF's Geographical Information Network of Alaska [GINA], Alaska Ocean Observing System [AOOS], etc.).

e. CPAI will provide the DWM with reports from studies (wildlife, habitat, erosion etc.) required by other agencies involved in permitting lands associated with the Willow Project, and to the maximum extent practical where multiple study requirements can be aligned, avoid duplication of study efforts among the NSB and such other agencies.

f. To the extent practicable, CPAI and its contractors will minimize flights by hiring local boat drivers, snow machine drivers, and allowing their contractors to camp at a study site.

g. To the extent practicable, CPAI will involve students from Nuiqsut (or other North Slope communities if no students are available from Nuiqsut) in their studies.

B. Caribou

CPAI will fund a caribou study to analyze the distribution and movements of caribou around the Willow Project area and adjacent areas to assess habitat relationships and possible impacts from development.

a. CPAI will fund a third party contractor to :
    i. Characterize pre-construction caribou movements utilizing historic telemetry data
    ii. Assist ADF&G or the NSB DWM in the collection of GPS telemetry data (e.g. potential purchase of additional caribou collars or database management etc.)
    iii. Determine caribou pre- and post-construction movement rates in relation to roads pipelines and pads associated with their project.
    iv. Characterize habitat conditions (e.g. snow melt, vegetation habitat, plant biomass, infrastructure etc.) within the study area using best available technology.
    v. Evaluate these indices of habitat conditions, with particular attention to possible impacts from development, on the distribution of caribou utilizing the study area.

C. Birds

Because the Willow project is farther west than previous development projects, there is concern about possible impacts to molting geese and other waterfowl. CPAI will conduct a study of molting waterfowl in the vicinity of the Willow Project and farther to the west. The final study

area will be determined in consultation with the DWM and after consulting with the US Fish and Wildlife Service to determine the area that is currently being monitored for molting geese. The study will be conducted for at least three years. After that time, the results will be reviewed and a determination will be made about whether the surveys need to continue and if so, for how long. The final determination will be made by the Land Management Administrator and Director of the DWM.

CPAI will fund a third party contractor to conduct a breeding shorebird study in and adjacent to the Willow project area. As this is known to be important shorebird breeding habitat, baseline studies will be conducted annually pre-development, and at least once every three years after development has been initiated. This study will document shorebird abundance, density, and nesting success.
CPAI will fund a third party contractor to conduct a Yellow-billed Loon study in and adjacent to the Willow project area. To minimize impacts to breeding Yellow-billed Loons, the study will document presence and habitat use (breeding/non-breeding) through techniques such as aerial or ground surveys, but will avoid nest examination until termination of nesting.

D. Fish

Fish studies required by these stipulations will be conducted by a third party. These studies will provide baseline data in order to help detect possible impacts, mitigate impacts, or conduct a damage assessment in the event of oil spills and/or release of oil-related products. Potential impacts are not restricted to population level effects.

a. CPAI will repeat required predevelopment studies outlined by BLM and FWS (herein called baseline) every four years. Should differences be detected from baseline, then CPAI will consult with NSB-DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for Willow, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.

b. CPAI will experimentally determine the effect of sublethal hydrocarbon exposure and persistence of detection of exposure on two species of fish (fourhorn sculpin and Arctic Cisco) and two prey items of fish, at four temperatures that reflect local seasonal changes (summer, autumn, and spring and winter) using , Alaska North Slope Crude oil and, when available, hydrocarbon from Willow (i.e., not mixed to produce ANS Crude). This experimental method must be developed so that it can used to determine whether fish and their prey items have been exposed during accidental releases of hydrocarbons from CPAI operations. If no accidental releases occur in 10 years, then repeat experiment using more updated tools, methodologies, analyses, making sure that previous experimental results can be compared. If data are not sufficient to fulfill this stipulation, additional studies may be required.

c. Fish detected with water mold (or other newly emerging infections) in both the Nuiqsut Fall Fishery and in areas associated with ConocoPhillips influence will be recorded, collected, and reported to the DWM.

E. Water Quality

a. CPAI will collect data on water quality and hydrology to help detect potential project related impacts on fish and the subsistence fishery:

i. CPAI will be required to repeat required predevelopment studies outlined by BLM and FWS (herein called baseline) every four years. Should differences be detected from baseline, then CPAI will consult with NSB-DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for Willow, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.

F. Subsistence

a. CPAI will fund a contractor to design and conduct a subsistence study that investigates the effects of the company's Willow development activities and associated infrastructure, as well as future exploration and development activities and associated infrastructure, to subsistence hunters from Nuiqsut. The study should focus on all ConocoPhillips facilities and activities within the area that is subject to this re-zone, as well as facilities and activities outside of this area that have the potential to impact subsistence resources and activities within the area, as determined by discussions with DWM and Planning staff. The project should at a minimum:

i. Examine possible effects from CPAI developments and activities to subsistence activities, especially on caribou and migratory bird hunting.
ii. Document hunter concerns and opinions about impacts from the ConocoPhillips facilities and activities associated with this rezone.

4. **Minimizing Traffic Impacts**

CPAI shall coordinate with KSOP, Kuukpik, and the NSB Planning and Wildlife Departments to establish standard air traffic routes that will minimize interference with animal concentrations. (Concentrations of caribou herds are of particular concern.) CPAI shall follow these routes unless there is a threat to human safety or an animal concentration or subsistence user is positioned along the routes

5. **Onshore Oil and Gas Pipelines and Roads**

A. General: Siting, design, construction and maintenance of pipelines must minimize alteration of shorelines, water courses, wetlands, tidal marshes and avoid significant disturbance to important habitats and critical migration periods.

B. Consolidation: Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, must be consolidated to the maximum extent possible.

C. Wildlife Crossing: Pipeline design and construction shall be based on the best available information and include adequate pipeline elevation, ramping, or burial to provide for unimpeded wildlife crossing. Aboveground pipelines and all associated infrastructure (including fiber optic and other cables) must be elevated at or above the 7-foot minimum height except at those points where the pipeline intersects a road, pad, or caribou ramp, or is constructed within 100 feet of an existing pipeline that is elevated less than 7 feet.

D. Placement: CPAI must adhere to the following requirements to the maximum extent practicable.

1. Pipelines must be separated from roads by a minimum distance of 500 feet (except at those points where the pipeline intersects a road, pad or caribou ramp).

2. Pipelines shall not be constructed at a distance greater than 1,000 feet from any access road.

3. Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited on the lake or lakebed and within 1500 feet of the ordinary high water mark of any fish-bearing deep lake (i.e., depth > 4m). If the fish-bearing status of a lake is unknown, the burden is on CPAI to demonstrate whether fish are present.

E. Drainage: Appropriate facilities shall be installed to ensure adequate drainage patterns.

F. Sedimentation: CPAI will monitor for sedimentation build-up or scouring resulting from all bridges, and provide the Administrator with results of such monitoring on a regular basis. The Administrator may require measures to mitigate sedimentation and scouring, including dredging, to ensure that the subsistence use area is maintained.

6. **Economic Opportunity**

A. Job Fairs: CPAI will host a job fair annually in Nuiqsut beginning after the Assembly's approval of CPAI's Application.

B. Employment Reports: CPAI shall submit annual reports to the Administrator by December 1st of each year showing the number of NSB residents employed by CPAI by job type. Overall employment statistics will be part of this reporting, showing the percentage of NSB resident employment, separate for Alaska resident employment. The

overall employment report will also reflect the total workforce, by resident location of CPAI's workforce in Alaska.

C. Bids: When CPAI solicits bids, it shall invite North Slope suppliers, subcontractors a regional and village corporations to bid on Willow projects for which they are qualified.

D. Subsistence Policy: NSB strongly urges CPAI to adopt a formal policy in order to avoid scheduling disruptions and misunderstandings when subsistence leave is needed while employed by CPAI. The use of seasonal employment options as a method of addressing subsistence leave flexibility is not a meaningful method of employment that allows NSB residents to gain CPAI experience workplace experience. This requirement should be passed onto all CPAI contractors to the maximum extent allowable.

E. Land Management Orientation: NSB shall provide land management orientation for CPAI for its Willow projects on an annual basis.

F. Subsistence Representative: CPAI shall fund a year round subsistence representative.

7. **Cultural and Historical Site Protection**

A. Data Points for Critical Sites: CPAI must contact the NSB Iñupiat History, Language and Culture (IHLC) Division at (907) 852-0422 and the State Historic Preservation Office (SHPO) to obtain a set of data points for sites of possible historic, prehistoric, cultural, traditional, archeological, and paleontological significance (Critical Sites). CPAI will maintain the data provided by IHLC in a secure place for internal use only and shall not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of the planned Willow and associated developments and associated facilities including roads, bridges, gravel pads, airstrips, and pipelines. CPAI will retain and update this data throughout the life of the development project. Prior to the completion of the development project, CPAI will come to an agreement with IHLC as to the disposition of IHLC data once the project is completed. Data points provided by IHLC in the form of geographic coordinates may be imprecise. CPAI is nevertheless responsible for ensuring that its operations do not cause any adverse impacts to Critical Sites and for reporting to IHLC the proper coordinates of any such site discovered. CPAI will release NSB from any liability associated with CPAI's use of these data points.

B. Buffer Zones: CPAI must maintain an effective buffer zone around all Critical Sites. An effective buffer zone will be at least 500 feet unless a smaller zone is necessary and can be mutually agreed upon by CPAI and the NSB Planning Department. CPAI must train its staff and contractors to observe this buffer and ensure that Critical Sites are not disturbed.

C. Discovery of Remains or Materials: Should any human remains or Critical Site materials (including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains) be discovered in the course of this field survey that were not

already identified by IHLC or SHPO, CPAI must stop all work in the vicinity of the discovery until CPAI has made contact with IHLC at (907) 852-0422, SHPO and, in the case of human remains, the Alaska State Troopers (AST), and has obtained these agencies' approvals to continue work. CPAI must submit any information discovered that may be of historic, prehistoric, cultural, traditional, archeological, and paleontological significance to IHLC (including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains). CPAI must not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of working on the planned Willow and associated developments and associated facilities (including roads, bridges, gravel pads, airstrips, and pipelines). CPAI must not remove or disturb any items that may be of historic, prehistoric, cultural, traditional archeological, and paleontological significance except to the extent needed to document their existence and to comply with state and federal law and this ordinance.

D. Allotments: CPAI must not trespass on Native Allotments or private property. Owner permission must be obtained in advance to enter onto the surface of these lands. CPAI must work with the Inupiat Community of the Arctic Slope (ICAS) and Native Allotment owners in and around the area in a beneficial manner.

E. Site Visits: Upon IHLC's request, CPAI must allow an IHLC representative to accompany CPAI during field work. The IHLC representative shall comply with all CPAI safety and operational rules and requirements when accompanying CPAI during field work.

8. **Reclamation Plan**

An abandonment/reclamation plan must be submitted to the Administrator within three (3) years of cessation of permitted activities. At a minimum, the plan must contain:

A. A grading and site plan drawn and certified by an Alaska licensed professional engineer or land surveyor, indicating the areas excavated or filled, the proposed finished grades and contours, drainage directions and any control structures to be installed;

B. The methods and plans to be employed for reclamation of the site during and after the activity shall be stated along with a time table for completions;

C. A description of all roads and structures and a site map showing the locations of all roads and development which will be built indicating which ones will remain after cessation of activities;

D. A description of any known reclamation requirements of any other governmental entity, and a copy of any reclamation plan under development or in existence for the activity; and

E. All maps shall be submitted at a scale of one inch equals 200 feet extending 200 feet beyond the site area with a maximum contour interval of five feet. The scale requirements may be adjusted by the Administrator to fit unusual circumstances.

9. **State, Local and Federal Compliance**

A. Other Permits: This approval shall not become effective until all other local, state and federal permits, approvals and authorizations have been issued. CPAI shall comply with all local, state and federal laws and regulations for all projects within the Unit area.

10. **Tundra Protection**

A. Vehicles must be operated in a manner such that the vegetative mat of the tundra is not disturbed and blading or removal of tundra or vegetative cover is prohibited unless specifically approved by the NSB Land Management Administrator or his designee.

B. Development is required to maintain the natural permafrost insulation quality of existing soils and vegetation.

C. Trails, campsites and worksite must be kept clean. No littering is allowed. All solid waste including incinerator residue must be backhauled to an authorized solid waste disposal facility.

D. Winter on-tundra travel may begin when six inches (6") of snow cover and twelve inches (12") of frost depth conditions exist, consistent with State regulations, for the activities intended as determined by an authorized field representative of the Administrator. Certain on-tundra activities may begin sooner than others depending on the impact or magnitude of the operations.

E. After April 15 of each year, on-tundra travel must be subject to termination within 72 hours of notification by the NSB Administrator or his/her designee for protection of surface vegetation.

cc: NSB Planning Commission
Harry Brower, Jr., Mayor, NSB
Brian Person, NSB Wildlife (caribou/fox/geese/vegetation)
Selene Tirre, Assessing Division, NSB
Jeanne.proulx@alaska.gov
Donna Wixon, USDI/BLM
Jeanne Frazier, Adele Lee, AkDNR/DO&G, Anchorage
Lee McKinley, ADF&G JPO Liaison, Anchorage
Audra Brase, ADF&G Regional Supervisor/Division of Habitat, Fairbanks
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Realty Director, Inupiat Community of the Arctic Slope
Rex Rock Sr., President, Arctic Slope Regional Corporation
Olivia Cabninboy, NSB Village Deputy Assistant
Mamie Pardue, City of Nuiqsut Mayor
Joseph Nukapigak, Kuukpik Corp. President
Raymond Ipalook, Native Village of Nuiqsut President

Mark Major, Permitting Agent, Kuukpik Village Corporation, majorinor@live.com
Willow Hetrick, Kuukpik Corporation
Tommy Nageak, Cultural Resource Specialist, NSB
Herbert Ipalook Jr., Field Inspector, Nuiqsut
Allyson Atos, Leroy Oenga Jr., Field Inspectors, Barrow
Wayne Cary, Assistant Attorney, NSB
LMR Staff
Files

STAFF RECOMMENDATION / NSB/RZ 21-001/GRB/mk/pl LMR Manager/lk

Exhibit 4

Proposed Conditions of Approval
In Response to Kuukpik Comments
North Slope Borough Ordinance Serial No. 75-06-75

1. Kuukpik proposed addition: "Use of insulation in roads, pads and airstrip to reduce the height (and visual barrier) of these features to minimize impacts on caribou movement."

   Proposed Condition of Approval: ConocoPhillips will use insulation in the Willow gravel infrastructure to reduce the height (and visual barrier) of these features to minimize impacts on caribou movement, subject to obtaining necessary permits and agency authorizations. ConocoPhillips will submit a detailed implementation plan, including explanation of where insulation is and is not practicable, to the North Slope Borough by September 30, 2021, pursuant to NSBMC Chapter 19.50.

2. Kuukpik proposed addition: "Reduction of the size of the airstrip to only what is needed for all aircraft that CPAI proposes to use at Willow."

   Proposed Condition of Approval: ConocoPhillips will reduce the length of the Willow airstrip to a maximum 5,700 feet long. Final approval of the airstrip dimensions will be determined in accordance with NSBMC Chapter 19.50. ConocoPhillips has no plans to use the Willow airstrip for Boeing 737s or similar passenger aircraft, and therefore will leave the surface of the runway as gravel. Any modification of this condition, including the use of Boeing 737s or similar passenger aircraft, will require approval of the North Slope Borough Assembly. The airstrip permit application will include an analysis of required runway dimensions based on aircraft manufacturer guidance, FAA requirements and recommendations, safety considerations, and engineering best practices.

3. Kuukpik proposed addition: "Restrictions on vehicle & aircraft use during sensitive periods (e.g. caribou calving & bird nesting)."

   Proposed Condition of Approval:

   Vehicle Plan. ConocoPhillips will provide to the North Slope Borough a vehicle plan that includes restrictions on and minimization of vehicle use during sensitive periods (caribou calving, bird nesting, and peak caribou subsistence activity). The objective of the vehicle plan is to mitigate potential impact of Willow project vehicle traffic on caribou calving, bird nesting, and peak subsistence activity. A vehicle plan for 2021 is attached. A vehicle plan for construction activities beginning in 2022 will be developed in consultation with the North Slope Borough Wildlife Department, and submitted for review and approval, in accordance with NSBMC Chapter 19.50, no later than September 1, 2021 and updated as needed when drilling and operations commence.

   Aircraft Plan. ConocoPhillips will provide to the North Slope Borough an aircraft plan that minimizes aircraft use during sensitive periods (caribou calving, bird nesting, and peak caribou subsistence activity) and will include a communication protocol with the local community. The objective of the aircraft plan is to mitigate potential impact of Willow project air traffic on caribou calving, bird nesting, and peak subsistence activity. An aircraft plan will be developed in

consultation with the North Slope Borough Wildlife Department and submitted for review and approval, in accordance with NSBMC Chapter 19.50, at least six months prior to the Willow airstrip commissioning.

4. Kuukpik proposed addition: "Require provision of aircraft plans and vehicle plans for NSB approval."

   Proposed Condition of Approval: See above.

5. Kuukpik proposed addition: "Require the planned diesel pipeline to be extended from its current end point at Alpine to the Willow project area."

   Proposed Condition of Approval: ConocoPhillips will submit a diesel use plan for review and approval, in accordance with NSBMC Chapter 19.50, by October 31, 2021. The plan will include an analysis of diesel transportation, including the conversion of existing pipelines or the utilization of Willow pipelines authorized in the Willow EIS Record of Decision for diesel transportation. The objective of this plan is to minimize traffic impacts & spill impacts due to human error on roads in high-use subsistence areas.

6. Kuukpik proposed addition: "Inclusion of a "good neighbor" agreement on caribou."

   Proposed Condition of Approval:

   During the construction period of the Willow Project (prior to start-up of the central processing facility), if requested by the North Slope Borough Subsistence Mitigation Committee, in addition to the existing contributions, ConocoPhillips will provide an annual air charter for a group of Nuiqsut hunters and their gear to support caribou subsistence activities. This will be requested and administered by the North Slope Borough Subsistence Mitigation Committee.

   ConocoPhillips will develop a Good Neighbor Policy on caribou in consultation with the community of Nuiqsut and the North Slope Borough Wildlife and Planning Departments ("North Slope Borough"). ConocoPhillips will host at least one community workshop in the Village of Nuiqsut to obtain input from hunters and residents prior to October 31, 2021. The Good Neighbor Policy will include support to transport Nuiqsut caribou subsistence hunters and their gear to and from areas where caribou are available if it is determined that the Willow Project has significantly impacted the ability of the hunters to harvest caribou based on criteria in the Good Neighbor Policy. The determination will be made by the Director of the North Slope Borough Planning Department, in consultation with the North Slope Borough Wildlife Department. ConocoPhillips will submit a Good Neighbor Policy to the North Slope Borough on or before June 30, 2022 for review and approval, in accordance with NSBMC Chapter 19.50.

Proposed Conditions of Approval
In Response to Kuukpik Comments
North Slope Borough Ordinance Serial No. 75-06-75

7. **Proposed Condition of Approval:** ConocoPhillips will amend Section 1(b) of the Oil Spill Mitigation Fund Agreement for the Alpine Development District (executed August 2019) (Agreement), to incorporate the Willow Development District into the Agreement, with an effective date prior to Willow first oil. The Agreement will also be amended to include spills to land. To accomplish that, Section 2(a)(i) of the Agreement will be deleted in its entirety and replaced with the following: "CPAI's oil and gas activities in the Alpine or Willow Development Districts cause oil to be present on land or in the water, or on the ice over water." ConocoPhillips will submit this amendment for North Slope Borough review and approval, in accordance with NSBMC Chapter 19.50, six months prior to anticipated Willow first oil.

2021 Willow Vehicle Management Plan

Scope

This Vehicle Management Plan applies to ConocoPhillips Alaska, Inc. (CPAI) and contract personnel working in support of the Willow Project. This plan shall cover field construction activities in 2021. A separate plan will be submitted for activities occurring in 2022 and beyond no later than September 1, 2021.

2021 field activities include the following:

Winter:

- Mobilization, setup, & operation of temporary accommodation facilities
- Construction and maintenance of seasonal ice roads
- Preparation and opening of the new Willow Mine Site near the Tinmiaqsiugvik River
- Gravel excavation
- Construction of up to 2.8 miles of road from GMT-2 west toward the Willow project area

Summer:

- Operation of temporary accommodation facilities
- Gravel conditioning activities
- Potential insulation installation in sections of new road west of GMT2
- Maintenance and upkeep of stranded equipment

No summer tundra travel is planned for 2021.

Regulatory Requirement

The objective of this vehicle management plan is to mitigate potential effects on caribou and birds due to Willow Project vehicle traffic. This requirement is derived from Measure 18 as stipulated in the Willow MDP EIS Record of Decision, as well as the Willow MDP NSB Rezone Stipulations and Mitigation Measures (NSB Ordinance Serial No. 75-06-75).

Purpose

The purpose of this Standard Operating Procedure is to ensure compliance with Willow MDP EIS ROD Measure 18 as well as the Willow MDP NSB Rezone Stipulations and Mitigation Measures (NSB Ordinance Serial No. 75-06-75).

Vehicle Traffic Reduction

Traffic reduction results from use of the new Willow Mine Site rather than the ASRC mine site, which reduces haul distance and traffic near Nuiqsut. In order to further reduce vehicle traffic, the following shall be implemented and adhered to as is feasible while maintaining safe vehicle movement practices for personnel and equipment.

- Locate temporary camps in the vicinity of the Willow Mine Site to minimize travel distances
- Minimize light duty vehicle traffic through use of bus transportation of crews to and from man camps to the work location and to the CD1 Airstrip during mobilization and demobilization
- Mid-shift meals (i.e. lunch) will be taken at the work site rather than returning to camp
- Other reasonable options to reduce traffic during construction shall be evaluated and implemented as identified

ConocoPhillips will work with the gravel execution contractor to implement these practices and identify other potential traffic reduction mitigations during contract readiness planning, prior to contractor mobilization to the Willow Project Area

Caribou and Birds Protective Measures

The following protective measures (consistent with safe movement of equipment and personnel) will be implemented to mitigate potential effects to caribou and nesting birds in the Willow Project Area:

- All workers will be provided caribou-specific training on this vehicle use plan, including the mitigations described below, and the importance of minimizing disturbance to the species.
- Speed limits of 35 mph on gravel roads
- Vehicle traffic shall stop when 25 or more caribou appear to be approaching the road.
- Implement periodic traffic closures (two 1-hour periods per day or as determined by BLM) when groups of caribou are near the road for greater than 12 hours and traffic exceeds 15 vehicle trips per hour.
- All wildlife have the right-of-way, and traffic will be slowed or stopped to allow animals to cross roads. Drivers and passengers will continually watch for caribou while traveling on roadways. Personnel will not attempt to move groups of caribou off roads or pads. Honking horns, revving engines, yelling, and excessive speed are not allowed.
- CPAI policy does not allow any workers to approach, harass or bait caribou or other wildlife they may encounter in the field.

Seasonal Protective Measures

In addition to the measures described above, the following shall be implemented during the caribou calving season (25 May to 30 June) and fall migration season (15 Aug to 15 September) within the Willow Project Area (west of GMT2):

- Vehicle speed shall be reduced to 25 mph
- Vehicles shall stop and turn off their engine when caribou are crossing the road within 25 feet of the vehicle
- Vehicle drivers and passengers are not to leave the gravel footprint and walk on the tundra without clearance from a Field Environmental Coordinator

Vehicle Idling

Willow personnel and equipment shall adhere to the Vehicle Idling Policy as described in the North Slope Field Environmental Handbook (Section 3, page 17, Dec 2015 edition) as well as the general policies outlined below:

- **Summer Operation - May 1st through September 30th**
  - Vehicles will be shut off when not occupied.
- **Winter Operation - October 1st through April 30th**
  - At temperatures warmer than 0 degrees Fahrenheit vehicles will be turned off when not in use. Efforts should be made to plug vehicles in. If plug-ins are not available, vehicles must still be turned off. This includes short periods of time such as lunch breaks or delivery stops.
  - At temperatures between 0 and minus 30 degrees Fahrenheit vehicles must be parked on bull rails and plugged in, if available.
  - At temperatures colder than minus 30 degrees Fahrenheit, vehicles that see everyday use should be left running.

PRE-SHIFT WARMUP

Vehicles shall not be started sooner than 15 minutes before beginning of shift. Ensure vehicle contains a spill kit.

Conduct 360 around vehicle prior to start to ensure no leaks, duck pounds or containment devices are attached and no observed mechanical issues. Conduct an additional 360 after vehicle warms up and prior to moving vehicle.

EXEMPTIONS

Should there be a need to maintain the heat inside a vehicle due to special gear, electronic testing equipment that cannot be relocated, etc.,

An exemption must be applied for and approved by the Willow Construction Supervisor.

The vehicle must be away from camp, offices, living quarters, occupied structures and not near any air vents or intake on any facility. It must NOT occupy a bull rail space or parking area where plug-in's are located.

Dust Control

Willow personnel and equipment shall adhere to the Willow Dust Control Plan (WIL-01-RG-PLN-0003), as published by BLM in the Willow MDP Final EIS.

Inspection and Compliance

Adherence to this plan shall be a condition of contractor mobilization. All contract personnel shall be trained on this policy prior to arrival on site at Willow.

Additionally, once field activities are underway, CPAI security or designated contractor shall perform periodic and random surveillance of the project area to ensure that personnel abide by restrictions outlined in this management plan.

CPAI shall employ subsistence representatives throughout the gravel haul period to monitor project activities and adherence to this plan.

CPAI shall supply a report to the BLM Administrative Office following completion of 2021 activities, reporting of any roadkill of birds or mammals.

Willow Master Development Plan

Appendix E.15
Economics Technical Appendix

January 2023

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Memorandum

Date: April 20, 2022

To: Kristen Hansen, DOWL

From: Patrick Burden and Leah Cuyno

Re: Updated Economic Analysis of Proposed Alternatives for the Willow Master Development Plan Supplemental EIS

DOWL requested Northern Economics to quantify the potential economic impacts of the proposed alternatives being considered for the Supplement to the Willow Master Development Plan (MDP) EIS. The supplemental analysis addresses deficiencies identified in the August 2021 U.S. District Court of Alaska decision to vacate the earlier Record of Decision and Final EIS by including an additional alternative that would provide 'maximum protection' to surface values in the Teshekpuk Lake Special Area (TLSA). This new action alternative would result in less infrastructure in the TLSA. The results of this updated economic impact analysis will be used to inform the environmental consequences section of the Supplemental EIS (SEIS).

This memorandum transmits the results of the updated economic impact analysis and describes the approach, assumptions, and data used in the analysis.

Scope of Analysis

Project Alternatives

For the purpose of this quantitative analysis, the following action alternatives are analyzed-- Alternatives B, C, D, and E. Note that Alternative A, is the No Project alternative; no development will occur under this alternative and the existing or baseline economic conditions will continue.

Alternative B is the *Proponent's Project* alternative. The alternative provides the shortest road access from the GMT Unit to the proposed Willow facilities.

Alternative C is described as the '*disconnected infield roads*' alternative.

Alternative D is described as the '*disconnected access*' alternative.

Alternative E is described as the '*Three-Pad Alternative*'.

The proposed development scenarios for Alternatives B, C, and D include 5 drill sites, and construction of processing facilities at the Willow Central Processing Facility (WCF), a Willow Operations Center (WOC), access roads, pipelines, an airstrip, and a gravel mine.

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However, certain features, particularly with respect to location and access vary depending on the alternative. For example, Alternative C would not include a gravel road connection between the WCF and the three northern drill sites, BT1, BT2, and BT4. There would be no road bridge across Judy Creek. Instead, an annually- constructed ice road would provide seasonal ground access to these drill sites. Alternative C would require two WOCs and airstrips: a South WOC and airstrip near the WCF, and a North WOC and airstrip, near BT2.

Alternative D, on the other hand, considers a development in which the Plan Area does not have year-round gravel road access to GMTU and Alpine. Instead, the Plan Area would be accessible only by air, ice road, and limited low ground-pressure vehicle. Alternative D includes construction of an annual ice road from GMTU to the Plan Area. Alternative D retains gravel roads between Plan Area facilities for safety and spill response. Alternative D would require a new diesel pipeline to the WOC from the Kuparuk CPF2 and approximately 25 acres of additional gravel pad footprint at the WCF. The lack of flexibility to use existing North Slope infrastructure and associated constraints on construction and logistics would extend the construction phase, delay the first oil date, and affect operational efficiency and emergency response for the life of the development.

Alternative E is the additional alternative identified by the BLM and cooperating agencies to address the Alaska District Court's remand. Under this alternative, drill site BT4 will be eliminated, resulting in only 4 drill sites and a WCF to support the Willow Project. Additional features of this alternative include moving drill site BT2 to a location north of Fish Creek (BT2 North), expanding drill sites BT1 and BT2 to accommodate more wells, relocating drill site BT5 to the northeast location just outside of yellow-billed loon setback buffer, and eliminating the constructed freshwater reservoir.

More details on these different alternatives are provided in Chapter 2 of the SEIS document.

Economic Indicators

This analysis quantifies the potential economic effects or consequences of the Project alternatives with respect to the following economic indicators:

1. **Potential Revenues.** This analysis provides estimates of the following potential government revenue streams:
    - State of Alaska: Royalty Revenue, Property Tax, Production Tax, Oil Surcharge, Corporate Income Tax.
    - Federal Government: Royalty Revenue, Corporate Income Tax, Gravel sales
    - North Slope Borough: Property Tax

2. **Potential Employment.** This analysis provides estimates of the direct, indirect, and induced employment effects associated with the construction phase and operations phase of the proposed Project alternatives. Employment effects reflect the total number of average part-time and full-time jobs resulting from the proposed construction and production (operations) activities.
3. **Potential Labor Income.** This analysis provides estimates of the potential labor income effects associated with the construction phase and operations phase of the proposed Project alternatives.

Approach, Assumptions, and Data

Estimating Potential Revenues

To quantify the potential streams of government revenues, the cash-flow model originally developed by the Alaska Department of Natural Resources (DNR) for evaluation of oil and gas projects in the Alaska North Slope was adapted and modified to reflect the Willow MDP SEIS project alternatives. The DNR model is based on the current fiscal regime and contains input cells that are fixed due to statutes or regulations; the major fiscal model parameters are shown in the table below.

Table 1. Alaska Fiscal Model Parameters

Category	Definition (Alaska Statute)	Value
Conservation Surcharges ($/barrel)	*43.55.201, 43.55.300*	$0.05
North Slope Oil Tax	–	–
Production Tax Rate on PTV	*43.55.011 (e)*	35%
$/BOE QCE exclusion ($/barrel)	*43.55.165 (e)(18)*	$0.30
Overhead allowance for lease expenditures	*43.55.165 (a)(2), 15 AAC 55.271*	4.5%
Minimum tax	–	–
Minimum Gross Tax (applied on GVPP)	*43.55.011 (f)*	4.0%
Oil and Gas Property Tax	–	–
Property Tax Rate	*43.56.010*	2.0%
Gross Value Reduction on "New Oil"	–	–
GVR %	43.55.160 (f)	20.0%
Additional GVR % (New field, ROY>12.5%)	43.55.160 (f &g)	30.0%
GVR Year Limit	*43.55.160 (f)*	7
GVR Oil Price limit: 3 years with ANS price above	*43.55.160 (f)*	$70.00
State and Federal Income Tax	–	–
State Income Tax	–	9.40%
Federal Income Tax	–	21.00%

The major inputs and assumptions used in the model to reflect the proposed project include:

1. Capital Expenditures (CAPEX)

Over the last 10 years Northern Economics, Inc. (NEI) has been working on various development projects in the North Slope, to estimate the effects of oil and gas development on local communities, regional entities, and the State of Alaska. As part of

these projects, NEI has obtained cost information from company specific projects as well as from surveys of operating companies and businesses in the oil and gas support services sector.

The facility CAPEX estimates presented in this memorandum are based on data from five proprietary project CAPEX estimates that had central processing facilities. The CAPEX estimates were adjusted to fit the specification required by the DNR cash-flow model, and a linear regression equation for CAPEX was developed based on total volume of oil and natural gas liquids (NGLs) produced over the life of the field, and whether the project had seasonal access. The regression equation has the form of Seasonal Access (1 if seasonal access, 0 if year-round access) * 1015.96 + million barrels of oil and NGLs produced (MMBO) * 0.656946 + 4306.702. The equation has a coefficient of determination (r^2) of 0.60.

Drilling CAPEX was estimated using the same variables as the facility CAPEX. The drilling regression equation has the form of Seasonal Access (0,1) * 152.8 + MMBO * 1.30049 + 2875.411. The equation has a coefficient of determination (r^2) of 0.72.

The estimated drilling and facilities capital expenditures are shown in the table below.

Table 2. Estimated Capital Expenditures by Alternative, in millions of 2021 $

Capital Expenditure Item:	Alternatives B	Alternative C	Alternative D	Alternative E
Drilling	$3,914	$4,270	$4,331	$3,893
Facilities	$4,832	$5,847	$5,935	$4,821
Total:	$8,746	$10,118	$10,267	$8,714

Source: Northern Economics estimates.

2. Operating Expenditures (OPEX)

The OPEX regression equation has the form of MMBO * 0.039407392 + 4515.887379. Alternatives C and D have higher operating costs than Alternative B and E due to the additional costs of providing seasonal access and operating additional facilities.

The estimated total cumulative operating expenditures amount to $4.547 billion for Alternative B, $4.774 billion for Alternative C, $4.843 billion for Alternative D, and $4.546 billion for Alternative E.

3. Crude Oil Price Forecasts

Two oil price projections were used in this analysis to provide a range of estimates for the potential revenue effects— 1) the latest U.S. Energy Information Administration (EIA) oil price projections published in the *Annual Energy Outlook 2021* on February 3, 2021, and 2) the latest Alaska Department of Revenue (ADOR) oil price projections published in the *Revenue Sources Book Fall 2021* on December 24, 2021.

The ADOR oil price forecast (for ANS West Coast) reflects a more conservative price forecast (at $60.66 per barrel in real 2021$, average over 2022 to 2031 period) while the

EIA price forecast reflects a higher oil price scenario (at $80.33 per barrel in real 2021$, average over 2022 to 2050). The ADOR forecast is a 10-year forecast through 2029 and the EIA forecast is through year 2050. Prices beyond the timeframe published were extrapolated using the cumulative annual growth rate provided in the 10-year forecast.

4. Netback Costs: Tariffs/Transportation Costs

For royalty calculations, oil is valued at the wellhead, hence, netback costs which include marine transportation cost, quality adjustment, TAPS tariff, and pipeline and feeder line tariffs, are deducted from the projected market price. Estimates of netback costs used in this analysis are from the Alaska Department of Revenue's *Revenue Sources Book Fall 2021*; except for the feeder line tariff data which was obtained from the Alaska Department of Natural Resources, Division of Oil and Gas.

5. Projected Annual Production Volumes

The table below shows the total projected oil production under each alternative. All Alternatives have a 25-year production life. Oil production for Alternatives B, C, and E begin in Year 6 of the project life, while first oil production for Alternative D starts in Year 7.

Table 3. Annual Production Volumes in millions of barrels of oil (MMBO)

Year	Alternative B	Alternative C	Alternative D	Alternative E
6	60.39	60.39	0.00	60.31
7	66.48	66.48	60.39	66.88
8	59.30	59.30	66.48	60.18
9	52.58	52.58	59.30	51.74
10	46.40	46.40	52.58	45.67
11	41.10	41.10	46.40	39.43
12	36.92	36.92	41.10	35.38
13	33.28	33.28	36.92	31.20
14	29.85	29.85	33.28	27.83
15	26.74	26.74	29.85	25.24
16	24.21	24.21	26.74	23.06
17	21.50	21.50	24.21	20.93
18	19.07	19.07	21.50	18.62
19	16.23	16.23	19.07	15.96
20	14.19	14.19	16.23	13.93
21	12.32	12.32	14.19	11.98
22	10.93	10.93	12.32	10.47
23	9.68	9.68	10.93	9.27
24	8.77	8.77	9.68	8.31
25	8.07	8.07	8.77	7.57
26	7.46	7.46	8.07	6.94
27	6.32	6.32	7.46	5.87
28	6.19	6.19	6.32	5.82
29	5.66	5.66	6.19	5.22
30	5.23	5.23	5.66	4.84
31	0.0	0.0	5.23	0.0

Source: CPAI, 2022.

Estimating Employment and Income Effects

Direct manpower requirements for the Willow MDP were estimated by CPAI and presented in the results section below. The potential indirect and induced employment and income effects for this analysis were estimated using the IMPLAN model of the Alaska economy. The IMPLAN model is an input-output model that is commonly used in economic impact studies to measure the multiplier effects/stimulus effects of an economic development project.

The estimates of industry spending on capital expenditures (CAPEX; construction costs) and on operating expenditures (OPEX) for each of the project alternatives, as described above, were used as inputs for the model. The IMPLAN model provides estimates of the number of part-time and full-time indirect and induced jobs required to meet the increase in demand for goods, materials, and services during the construction and the operations phases of the proposed project. These indirect and induced jobs (and associated income) are considered the multiplier effects or stimulus effects that result from the increase in demand in various industries/sectors in the Alaska economy, particularly those that support the construction sector, and the oil and gas extraction/production sector (indirect effects), as well as all the other sectors that provide goods and services to the industry workers (induced effects).

The IMPLAN model provides estimates of indirect and induced labor income based on information on average Alaska wages and salaries in the various sectors of the economy. Prevailing annual average wages for oil and gas jobs are presented below.

Results

Projected Government Revenues

The Willow MDP is projected to generate revenues to the federal government, the State of Alaska, and the North Slope Borough from royalties, taxes, and other fees. The projected revenues by revenue stream and by Alternative are presented in the table below. The values shown in the table reflect the estimated total cumulative revenues through the end of the production life of the field.

Table 4. Estimated Potential Revenues of the Willow MDP SEIS Alternatives

Revenue Category	Alternative B		Alternative C		Alternative D		Alternative E	
	DOR Price	EIA Price	DOR Price	EIA Price	DOR Price	EIA Price	DOR Price	EIA Price
State of Alaska								
Royalty Revenue	$2,329.9	$3,662.3	$2,329.9	$3,662.3	$2,301.5	$3,701.2	$2,270.0	$3,560.1
Property Tax	$103.7	$103.7	$124.3	$124.3	$133.7	$133.7	$101.4	$101.4
Production Tax	$393.0	$3,622.9	$404.1	$3,273.5	$385.4	$3,593.2	$374.3	$3,399.1
Oil Surcharge	$26.2	$26.2	$26.2	$26.2	$26.2	$26.2	$25.5	$25.5
Corporate Income Tax	$833.2	$1,781.8	$677.3	$1,659.7	$630.1	$1,644.0	$783.0	$1,711.1
Total:	**$3,686.0**	**$9,196.9**	**$3,561.8**	**$8,746.1**	**$3,477.0**	**$9,098.4**	**$3,554.2**	**$8,797.3**
Federal Government								
Royalty Revenue	$2,329.9	$3,662.3	$2,329.9	$3,662.3	$2,301.5	$3,701.2	$2,270.0	$3,560.1
Corporate Income Tax	$1,726.9	$3,646.8	$1,411.3	$3,399.8	$1,315.8	$3,368.0	$1,625.3	$3,503.8
Gravel sales	$9.9	$9.9	$9.9	$9.9	$9.9	$9.9	$9.9	$9.9
Total:	**$4,066.7**	**$7,319.0**	**$3,751.1**	**$7,072.0**	**$3,627.2**	**$7,079.1**	**$3,905.2**	**$7,073.8**
North Slope Borough								
Property Tax	$1,278.6	$1,278.6	$1,533.2	$1,533.2	$1,649.3	$1,649.3	$1,250.1	$1,250.1

Source: Northern Economics estimates.

At the State level, there are several potential sources of revenues that would be generated from the proposed development. Production from the Willow development would result in royalties paid to the federal government, and State of Alaska would receive 50 percent of those royalties. The federal royalty rate is 16.67 percent of the wellhead value. Total estimated cumulative state royalties range from $2.27 billion to $3.70 billion.

The state would receive property tax payments on onsite facilities and these revenues would start accruing during the construction phase. Total State property tax revenues are projected to range between $101 million and $134 million, depending on the Alternative.

Oil produced and sold from lands within Alaska are subject to a severance tax as the resources leave the land. This severance tax is commonly referred to as the "production tax." The production tax applies to oil produced from any area within the boundaries of

the state, including lands that are owned by the state, the federal government (like NPR-A), or private parties, such as Native corporations. Severance tax or production tax payments are based on the current tax rate of 35 percent of the production value, which is the value at the point of production, less all qualified lease expenditures (net value). Qualified lease expenditures include certain qualified capital and operating expenditures. Total production taxes are estimated to range from $374 million to over $3.6 billion, depending on the oil price assumption and the Alternative.

An oil and gas corporation's Alaska income tax liability depends on the relative size of its Alaska and worldwide activities and the corporation's total worldwide net earnings. State corporate income tax is calculated as 9.4 percent of the Alaska share of worldwide income for each corporation. The ADNR model, however, does not take into consideration corporate worldwide income (which is unknown at this time) but simply evaluates all the costs and revenues and the resulting state income tax given the 9.4 percent income tax rate. Total estimated state corporate income tax payments could range between $630 million and $1.78 billion, depending on the Alternative and oil price assumption. In addition, the state would also receive oil surcharge revenues estimated to amount to about $26 million. Conservation surcharges apply to all oil production in Alaska and are in addition to oil and gas production taxes. Revenues derived from these surcharges are intended to be used for oil and hazardous substance release prevention and response

At the Federal level, projected federal royalty revenue, corporate income taxes, and gravel royalties could amount to between $3.63 billion and $7.3 billion (total through the entire economic life of the field).

At the regional level, the NSB government is anticipated to benefit from property tax revenues. The property tax would be based on the assessed valuation of the facilities developed onsite. The annual levy is based on the full and true value of property taxable under AS 43.56. For production property, the full and true value is based on the replacement cost of a new facility, less depreciation. The depreciation rate is based on the economic life of proven reserves. Pipeline property is treated differently; it is valued on the economic value of the property over the life of the proven reserves. The State property tax rate is 20 mills. A local tax is levied on the state's assessed valued for oil and gas property within a city or borough and is subject to local property tax limitations. The current tax rate for the NSB is 18.5 mills (hence, the state portion of the property tax is 1.5 mills). Property tax payments would start to accrue during the construction phase. Total cumulative NSB property tax revenues are estimated to amount to between $1.25 billion and $1.65 billion, depending on the Alternative.

The City of Nuiqsut could also potentially benefit from higher bed tax revenues from higher hotel occupancy during the initial construction years while mobilization of construction equipment is occurring and even during operations. The City of Nuiqsut

currently has a 12 percent bed tax. The change in the level of hotel occupancy however is difficult to quantify at this point because the timing and level of activities are uncertain and may vary. The City also has a tobacco tax that could generate additional revenues for the City. Furthermore, the City of Nuiqsut would be eligible to receive funds through the NPR-A Impact Mitigation Grant Program, which is funded by royalty and other revenues from leases in the NPR-A. As noted above, production from the Willow development is anticipated to generate royalties that would significantly increase funds for the NPR-A Impact Mitigation Grant Program.

Projected Employment and Income Effects

Table 5 presents the estimated direct manpower requirements during the construction phase for both the Proponent's Proposed Alternative (Alternative B) and Alternative E (the additional alternative being considered in the SEIS). These jobs will be required on the project site in the North Slope. Peak construction employment for both Alternatives is anticipated to occur in Year 4 of the project schedule with about 1,650 jobs (seasonal peak) jobs under Alternative B and about 1,700 jobs (seasonal peak) under Alternative E. The jobs created during the construction phase would be temporary, with some activities only occurring over several months (i.e., ice road construction). Given Alternative E's reduced infrastructure, the construction phase is expected to be shorter, lasting 8 years compared to 10 years under Alternative B.

Drilling activities are planned to occur over a period of 7 years starting in Year 5. Under Alternative E, drilling activities would require 390 annual average jobs in the North Slope from Year 5 through Year 8, and reduced to 195 jobs for the remaining 3 years of drilling (Year 9 to 11). Under Alternative B, 390 annual average jobs would be required from Year 5 through Year 10, then reduced to 99 jobs on the last year of drilling (Year 11). North-Slope based workers would be on a 2-week rotation so the number of workers on-site would be half of the numbers noted above. Drilling activities would also require 10 year-round jobs based in Anchorage.

Direct construction and drilling activities would also support on average about 3,000 indirect and induced part-time and full-time jobs per year in other sectors of the state's economy over the construction phase (under Alternatives B). Alternatives C and D would result in slightly higher indirect and induced jobs (about 3,500 and 3,900, respectively), mainly due to the higher estimated construction spending on additional facilities and logistics, while Alternative E is projected to result in about 2,900 indirect and induced jobs.

Table 5. Estimated Number of Direct Construction Jobs

Year	Proponent's Proposed Alternative		Alternative E	
	Seasonal Peak	Annual Average	Seasonal Peak	Annual Average
1	40	26	40	26
2	200	130	200	130

Year	Proponent's Proposed Alternative		Alternative E	
	Seasonal Peak	Annual Average	Seasonal Peak	Annual Average
3	750	488	750	488
4	1,650	1,073	1,733	1,127
5	1,500	975	1,650	1,073
6	950	618	950	618
7	350	228	350	228
8	100	65	100	65
9	100	65	–	–
10	100	65	–	–

Source: CPAI, 2022.

During the operations phase, Alternative E is projected to generate the same number of direct O&M jobs as the Project Proponent's Alternative as shown in Table 6. The project is estimated to support 25 year-round jobs based in Anchorage during the operations phase of the project. The North Slope based job numbers shown in the table are the estimated number of workers required for O&M activities assuming a 2-week rotation. The number of workers onsite at any given time would be half of the number shown in each year in the table above (CPAI, 2022). These operations and maintenance jobs would mostly be year-round but there will be some jobs associated with production activities that will also be seasonal in nature.

Table 6. Estimated Number of Direct O&M Jobs: Proponent's Project Alternative and Alternative E

Year	Slope Based	Anchorage Based
6	100	25
7	275	25
8	400	25
9+	425	25

Source: CPAI, 2022.

In addition to the direct jobs, annual operations and maintenance activities are estimated to create an additional 360 to 400 indirect and induced jobs per year.

These estimated jobs are available for workers residing in the North Slope, other areas of Alaska, and outside Alaska. It is unknown at this time how many workers from North Slope communities and other Alaska communities would participate in the direct oil and gas activities. According to the Alaska Department of Labor and Workforce Development, over the past decade, the share of oil industry workers who are not Alaska residents has grown, ranging from 31 percent nonresident in 2010 to 35 percent in 2020. This percentage of non-resident workers could change in the future, depending on availability of training programs and labor supply.

Oil field development projects in the North Slope typically require specialty tradesmen and construction workers with the skills and experience in ice roads, pipeline construction, facilities construction, and drilling; and these jobs are typically held by non-local workers. However, opportunities do exist for North Slope residents that live

near existing oil developments. Local residents have participated in oil and gas jobs such as ice road monitors, camp security and facilities operators, and subsistence representatives. The Alaska Department of Labor and Workforce Development and the oil and gas industry have training programs geared towards developing special skills required in oilfield services. This is expected to create more employment opportunities for local residents.

Table 7 shows the prevailing average yearly earnings of workers in various industries in Alaska that are associated with the direct construction and operations jobs described above. The table shows that direct oil and gas industry jobs currently pay about $170,000 per year; and the oil and gas extraction sector paying even more at approximately $242,000 per year.

Note that a direct oil and gas industry worker either works for an oil producer or an oilfield service company. Thousands of other jobs that directly serve the oil and gas industry but are not categorized under this sector are generally included in the Support Activities for Mining sector; some of these jobs are in security, catering, accommodations, transportation, and logistics services.

Indirect and induced jobs, on the other hand, would be jobs in a variety of other sectors of the Alaska economy that provide goods and services to the oil and gas industry and its direct workers. The projected annual average earnings associated with these indirect and induced jobs are estimated to be about $60,500.

Table 7. Prevailing Statewide Average Annual Earnings by Selected Industries associated with the Direct Construction and Operations Jobs

Industry	Average Annual Earnings
Oil and Gas Industry	$169,632
Oil and Gas Extraction	$242,160
Support Activities for Mining	$119,268
Construction (industry-wide average)	$82,356
Construction of Buildings	$76,428
Heavy Construction	$110,748
Specialty Trade Contractors	$71,052

Source: QCEW 2020 data, ADOLWD,2022.

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Willow Master Development Plan

Appendix E.16
Subsistence and Sociocultural Systems Technical Appendix

January 2023

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List of Acronyms

ATV	all-terrain vehicle
CRD	Colville River Delta
MDP	Master Development Plan
NSB	North Slope Borough
Project	Willow Master Development Plan Project
SRB&A	Stephen R. Braund and Associates

Glossary Terms

Direct effects analysis area – All subsistence use areas within 2.5 miles of Willow Master Development Plan Project infrastructure.

Household – One or more individuals living in one housing unit, whether or not they are related.

Subsistence – A traditional way of life in which wild renewable resources are obtained, processed, and distributed for household and community consumption according to prescribed social and cultural systems and values.

Subsistence use areas – The geographic extent of a resident's or community's use of the environment to conduct traditional subsistence activities.

1.0 SUBSISTENCE USES AND PRACTICES, NUIQSUT AND UTQIAĠVIK

This appendix provides detailed data tables, figures, and discussion related to Nuiqsut and Utqiaġvik (Barrow) **subsistence** uses. The Willow Master Development Plan (MDP) Final Environmental Impact Statement defines the analysis area for subsistence and sociocultural systems as all areas used for subsistence activities by the communities of Nuiqsut and Utqiaġvik. These study communities were selected because they both have documented use near the Willow MDP Project (Project) and would be most likely to experience direct and indirect effects to subsistence uses. The following sections provide a brief introduction to Iñupiat subsistence harvesting patterns followed by a description of each community's **subsistence use areas**, harvest and use data, timing of subsistence activities, travel methods, and resource importance.

1.1 Introduction

The Iñupiat are an Alaska Native people whose territory extends throughout northwest and northern Alaska. Archaeological research indicates that humans have occupied northern Alaska for roughly 14,000 years (Kunz and Reanier 1996). At the time of European contact, the North Slope was inhabited by two indigenous Iñupiat populations: the Tagiugmiut and the Nunamiut. The Tagiugmiut ("people of the sea") inhabited coastal areas of the Arctic Coastal Plain and relied primarily on harvests of marine mammals, terrestrial mammals (mainly caribou), and fish. The Nunamiut ("people of the land") inhabited the interior, including the Brooks Range and Arctic foothills areas, and relied mostly on terrestrial mammals and fish, with caribou comprising the majority of their subsistence harvests. Being located on or near the coast, the study communities of Nuiqsut and Utqiaġvik were traditionally inhabited by the Tagiugmiut. The Iñupiat remain the primary occupants of the North Slope today and continue the traditions of their ancestors, including hunting, harvesting, and sharing wild resources. Subsistence activities tend to occur near communities, along rivers and coastlines, or at particularly productive sites where resources are known to occur seasonally. Residents often conduct subsistence activities from camps located in areas that provide access to multiple resources throughout the year. Harvesters apply traditional knowledge, which is passed down through generations and learned through experience on the land, to determine the locations, timing, and methods for their subsistence activities. Relevant traditional knowledge includes knowledge about the distribution, migration, and seasonal variation of animal populations and other environmental factors such as tides, currents, ice, and snow conditions.

Prior to the 1950s, when mandatory school attendance and economic factors such as a decline in fur prices compelled families to permanently settle in centralized communities, the Iñupiat were seminomadic and ranged over large geographic areas for trapping, fishing, gathering, and hunting activities. Contemporary subsistence use areas include many of these traditional use areas. Certain harvest locations are used infrequently or by a small number of harvesters; however, these places may still be important to a community if they are particularly productive areas or if they have cultural, historical, or familial significance to the user. As an example, while the Prudhoe Bay development area is no longer part of the contemporary use area of the Nuiqsut people, residents continue to identify with the area as part of their traditional territory due to its historical use by their ancestors. Like other communities on the North Slope, Nuiqsut and Utqiaġvik have a "mixed, subsistence-market" economy (Walker and Wolfe 1987), where families invest money into small-scale, efficient technologies to harvest wild foods. In recent years, the advent of snow machines and all-terrain vehicles (ATVs), including four-wheelers, has reduced the time required to travel to traditional hunting and harvesting areas but has also increased the need for cash employment to purchase, maintain, and procure supplies for the new equipment, a hallmark of the mixed cash economy (Ahtuangaruak 1997; Impact Assessment Inc. 1990a, 1990b; SRB&A and ISER 1993; Worl and Smythe 1986).

While the use of camps and cabins continues, residents of the North Slope today more commonly use their communities as a base from which they conduct same-day subsistence activities (Impact Assessment Inc. 1990a; SRB&A 2010b, 2017a).

1.2 Subsistence Overview

1.2.1 Nuiqsut

Nuiqsut is located on the Nigliq Channel of the Colville River, in an area that provides abundant opportunities for the subsistence harvesting of terrestrial mammals, marine mammals, fish, and waterfowl. Although the location is

less advantageous for marine mammal harvests than some other North Slope communities that are located directly on the coast, the Beaufort Sea is easily accessible via the Nigliq Channel. The Colville River is the largest river system on the North Slope and supports the largest overwintering areas for whitefish, which local residents harvest in substantial quantities (Craig 1987; Seigle, Gutierrez et al. 2016).

The Nuiqsut area was traditionally a gathering place where Iñupiat and Athabascan people gathered to trade and fish, maintaining connections between the Nunamiut and the Tagiugmiut (Brown 1979). After the 1971 passage of the Alaska Native Claims Settlement Act, 27 Iñupiat families from Barrow (since renamed Utqiaġvik) resettled at Nuiqsut to live a more traditional lifestyle and to reclaim their ancestral ties to the area (Impact Assessment Inc. 1990b). The site was selected primarily for its easy access to the main channel of the Colville River for fishing and hunting and for the ease of movement between upriver hunting sites and downriver whaling and sealing sites (Brown 1979).

Today, according to the most recent U.S. Census in 2020, Nuiqsut has a population of 512 residents living in 130 occupied **households** (USCB 2021). Primary sources of employment in the community include the village corporation (Kuukpik Corporation), the North Slope Borough (NSB), and the NSB school district (NSB 2018). Nuiqsut is one of 11 Alaska Eskimo bowhead whaling communities. It is the closest community to the major oil-producing fields of the North Slope, which have resulted in impacts to subsistence and sociocultural systems (SRB&A 2009, 2017a, 2018) but also provide jobs, corporate dividends, and local revenue. During winter, Nuiqsut residents have seasonal access to the Dalton Highway via Alpine, Kuparuk, and Prudhoe Bay development roads. This access allows residents to travel to Fairbanks and Anchorage to purchase subsistence equipment and supplies, including boats, snow machines, firearms, and ammunition at reduced cost.

1.2.1.1 Subsistence Use Areas

Figure E.16.1 depicts Nuiqsut subsistence use areas for all resources over multiple historic and contemporary time periods (BLM 2004; Brown, Braem et al. 2016; Pedersen 1979, 1986; SRB&A 2010b). Use areas from all these studies overlap with portions of the Project area. Lifetime (pre-1979) use areas show Nuiqsut residents using a large area centered on the community to harvest subsistence resources; reported use areas extended offshore approximately 15 miles, as far east as Camden Bay, south along the Itkillik River, and west as far as Teshekpuk Lake. Subsequent use area data show Nuiqsut residents traveling across a progressively larger area to harvest subsistence resources. Use areas for the 1995–2006 time period document Nuiqsut residents traveling beyond Atqasuk in the west, offshore more than 50 miles northeast of Cross Island, overland to Cape Halkett and Utqiaġvik in the north, to Camden Bay in the east, and beyond the Colville River in the south. The majority of these use areas are concentrated around the Colville River, in areas to the southwest of the community, offshore areas north of the Colville River Delta (CRD), and northeast of Cross Island. Use areas for other time periods (1973–1986; 2014) are generally within the extent of the Pedersen (1979) and Stephen R. Braund and Associates (SRB&A) (2010b) use areas described above. SRB&A (2010b) notes that for the 1995–2006 time period, wolf and wolverine use areas continued farther south toward Anaktuvuk Pass but were not documented due to the extent of the map used during interviews.

Nuiqsut subsistence use areas for individual resources are shown on Figures E.16.2 through E.16.9 for the time periods listed above, in addition to the 2008–2019 time period (SRB&A 2021) for caribou only. Nuiqsut subsistence use areas for large land mammals are shown on Figures E.16.2 through E.16.4. Nuiqsut caribou use areas are shown on Figure E.16.2. As indicated on the figure, areas consistently used by Nuiqsut residents for caribou hunting are in an overland area between the Ikpikpuk and Kuparuk rivers, north to the coast, and south along the Colville River. The maximum extent of the use areas documented among all the studies extends from Atqasuk in the west toward Point Thomson in the east and south along the Colville and Anaktuvuk rivers to Anaktuvuk Pass. SRB&A's (2010b) overlapping use areas show that the greatest number of caribou use areas are concentrated along the Colville River and CRD, along the Itkillik River, and overland to the west and south of the community; these areas generally correspond to the caribou hunting areas reported during the 2008–2019 study years (SRB&A 2021).

Nuiqsut moose use areas (Figure E.16.3) show residents' consistent use of areas adjacent to the Colville River for moose harvests. While lifetime (pre-1979) use areas were completely confined to the Colville River, more recent moose use areas have expanded to include other tributaries such as the Chandler and Anaktuvuk rivers and Fish Creek. Moose use areas for the 1995–2006 time period show the highest amount of overlapping use along the Colville River south of Nuiqsut as far as Umiat. Figure E.16.4 depicts Nuiqsut grizzly bear use areas for the

lifetime and 1973–1986 time periods, including areas along the Colville River watershed from Fish (Iqalliqpik) Creek to Umiat.

Nuiqsut furbearer and small land mammal use areas are shown on Figure E.16.5. Lifetime (pre-1979) use areas show residents using overland areas near the community, as well as the more southern Colville, Chandler, Anaktuvuk, Itkillik, and Kuparuk rivers, to harvest small land mammals. Subsequent studies, including those for the 1973–1986 and 1995–2006 time periods, depict an expansion from previously recorded use areas. SRB&A's (2010b) wolf and wolverine use areas for the 1995–2006 time period extend to the Meade River in the west and beyond the Dalton Highway in the east, including a single-use area that extends east to just south of Kaktovik. Small land mammal use areas for the most recent available use area study show less use to the east and west of the community and more use south into the Brooks Range.

Nuiqsut fishing areas from multiple time periods (Figure E.16.6) indicate consistent use of the Colville River and smaller tributaries, including the Itkillik, Chandler, and Anaktuvuk rivers as well as Fish and Judy (Kayyaaq) creeks. Contemporary use areas extend somewhat father along the Colville and Itkillik rivers as well as along Fish Creek.

Nuiqsut use areas for birds (Figure E.16.7) are mostly concentrated along the Colville River and nearby overland areas for various time periods, although they also include offshore eider hunting areas extending from Cape Halkett to Camden Bay. Lifetime (pre-1979) wildfowl use areas are generally located near the Colville River and in nearshore locations extending east to Prudhoe Bay. More recent goose and eider use areas (1994–2003 and 1995–2006 time periods) occur in a somewhat larger area and include areas offshore and east of Prudhoe Bay to Camden Bay. The most recent documentation of bird use areas for the 2014 time period shows them to be north of the community and offshore into Harrison Bay.

Figure E.16.8 displays Nuiqsut use areas for vegetation for several time periods and shows use of the Colville River as far south as Umiat and areas near Fish Creek for harvests of vegetation and berries. In addition, berry gathering areas were documented along the Itkillik, Chandler, and Anaktuvuk rivers during a study for the 1994–2003 time period.

Nuiqsut marine mammal use areas (Figure E.16.9) show use of the Beaufort Sea and CRD at varying extents, depending on the time period. Lifetime Nuiqsut use areas for marine mammals included offshore areas from Atigaru Point to Kaktovik at distances of less than 20 miles; subsequent studies documented use areas extending to Cape Halkett in the west and varying distances to the east. SRB&A's (2010b) use areas showed Nuiqsut residents harvesting marine mammals up to 40 miles offshore to the north of the community and even farther offshore (approximately 60 miles) in an area near Cross Island, a sandy barrier island used traditionally and currently as a base of operations for Nuiqsut whaling crews. Nuiqsut 2001–2016 bowhead whale hunting global positioning system tracks extend as far east as Flaxman Island and over 30 miles offshore from Cross Island.

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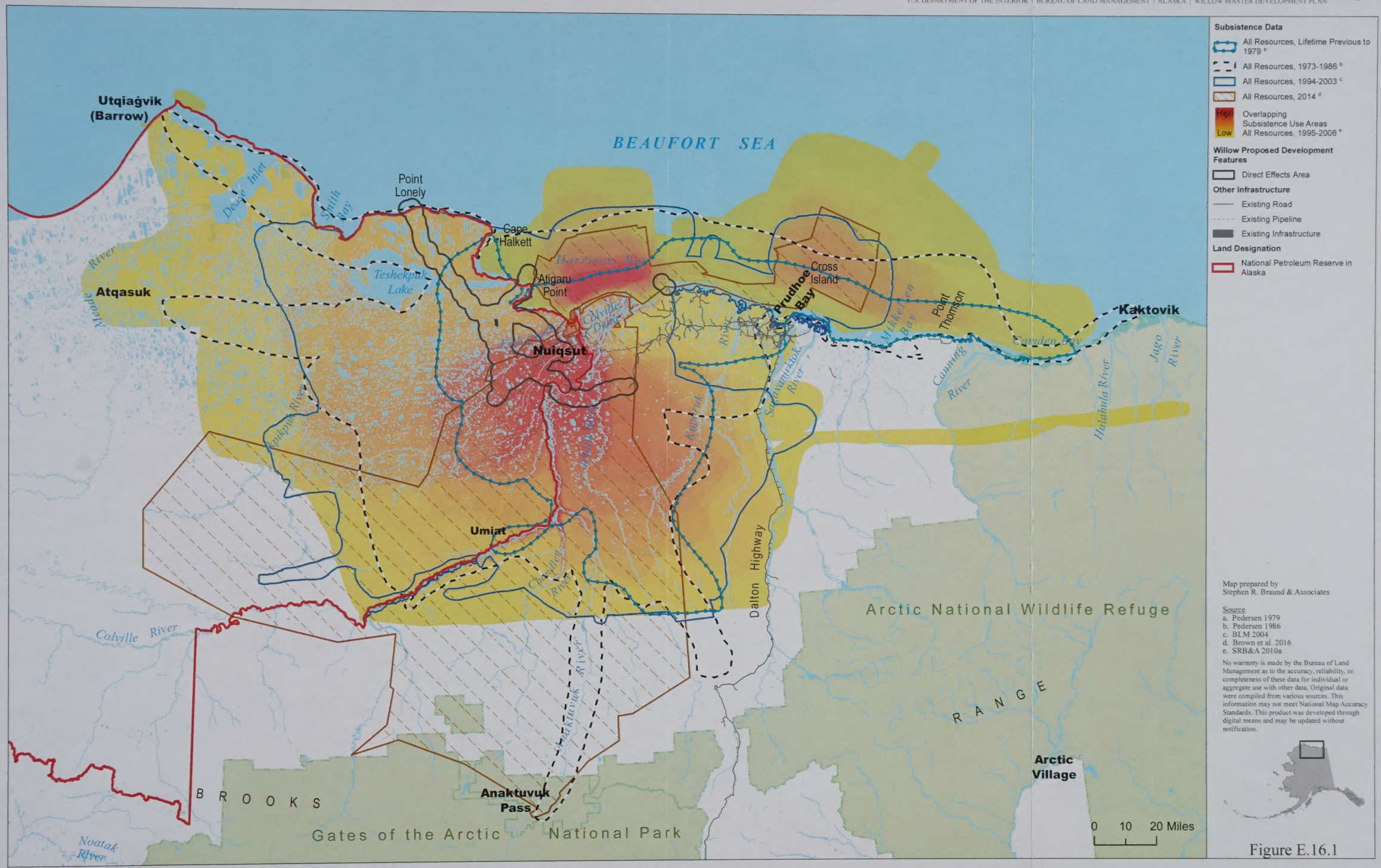

Subsistence Data

- All Resources, Lifetime Previous to 1979 [a]
- All Resources, 1973-1986 [b]
- All Resources, 1994-2003 [c]
- All Resources, 2014 [d]
- Overlapping Subsistence Use Areas All Resources, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.1

BEAUFORT SEA

Utqiaġvik (Barrow)

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Prudhoe Bay

Cross Island

Point Thomson

Kaktovik

Camden Bay

Atqasuk

Nuiqsut

Umiat

Anaktuvuk Pass

Dalton Highway

Arctic Village

Arctic National Wildlife Refuge

RANGE

BROOKS

Gates of the Arctic National Park

Meade River

Ikpikpuk River

Colville River

Noatak River

Smith Bay

Teshekpuk Lake

Fish Creek

Kuparuk River

Sagavanirktok River

Canning River

Hulahula River

Jago River

Chandler River

Anaktuvuk River

0 10 20 Miles

Subsistence Data

- Caribou, Lifetime prior to 1979 [a]
- Caribou, 1973-1986 [b]
- Caribou, 1994-2003 [c]
- Caribou, 2014 [d]
- Caribou, January 2008 - December 2019 [e]
- Overlapping Subsistence Use Areas Caribou, 1995-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2021
f. SRB&A 2010a

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Figure E.16.2

Lifetime previous to 1979 and 1973-1986

1995-2006

1994-2003

2014

All Datasets

0 10 20 Miles

Subsistence Data
- Moose, Lifetime previous to 1979 [a]
- Moose, 1973-1986 [b]
- Moose, 1994-2003 [c]
- Moose, 2014 [d]
- Overlapping Subsistence Use Areas Moose, 1995-2006 [e] (High / Low)

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

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Figure E.16.3

Map prepared by
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Source
a. Pedersen 1979
b. Pedersen 1986

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Figure E.16.4

BEAUFORT SEA

Utqiaġvik (Barrow)
Point Lonely
Cape Halkett
Harrison Bay
Atigaru Point
Prudhoe Bay
Cross Island
Kaktovik
Atqasuk
Nuiqsut
Umiat
Anaktuvuk Pass
Arctic Village
Deadhorse
Dalton Highway
Arctic National Wildlife Refuge
Gates of the Arctic National Park
BROOKS RANGE
Dease Inlet
Smith Bay
Meade River
Teshekpuk Lake
Colville Delta
Fish Creek
Kuparuk River
Sagavanirktok River
Mikkelsen Bay
Point Thomson
Canning River
Camden Bay
Jago River
Hulahula River
Epikpuk River
Killik River
Chandler River
Itkillik River
Colville River
Noatak River

Subsistence Data
- Furbearer and Trapping, Lifetime previous to 1979 [a]
- Furbearers and Small Land Mammals, 1973-1986 [b]
- Wolf and Wolverine, 1994-2003 [c]
- Small Land Mammals, 2014 [d]
- Overlapping Subsistence Use Areas, Wolf and Wolverine, 1995-2006 [e] (High / Low)

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

0 10 20 Miles

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.5

BEAUFORT SEA
Utqiaġvik (Barrow)
Point Lonely
Cape Halkett
Harrison Bay
Atigaru Point
Teshekpuk Lake
Atqasuk
Meade River
Dease Inlet
Smith Bay
Nuiqsut
Prudhoe Bay
Cross Island
Point Thomson
Mikkelsen Bay
Kaktovik
Camden Bay
Canning River
Hulahula River
Jago River
Sagavanirktok River
Kuparuk River
Itkillik River
Ikpikpuk River
Colville River
Umiat
Chandler River
Anaktuvuk River
Dalton Highway
Arctic National Wildlife Refuge
RANGE
Arctic Village
Anaktuvuk Pass
BROOKS
Gates of the Arctic National Park
Noatak River
0 10 20 Miles

Subsistence Data
- Fishing, Lifetime previous to 1979 [a]
- Fish, 1973-1986 [b]
- Fish, 1994-2003 [c]
- Fish, 1995-2006 [d]
- Fish, 2014 [e]

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. SRB&A 2010a
e. Brown et al. 2016

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.6

Nuiqsut Subsistence Use Areas, Birds

Appendix E.16 - Subsistence and Sociocultural Systems

U.S. DEPARTMENT OF THE INTERIOR | BUREAU OF LAND MANAGEMENT | ALASKA | WILLOW MASTER DEVELOPMENT PLAN

BEAUFORT SEA

Utqiaġvik (Barrow)

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Nuiqsut

Prudhoe Bay

Cross Island

Point Thomson

Kaktovik

Camden Bay

Atqasuk

Dease Inlet

Smith Bay

Meade River

Teshekpuk Lake

Colville Delta

Ikpikpuk River

Itkillik River

Kuparuk River

Sagavanirktok River

Mikkelsen Bay

Canning River

Hulahula River

Jago River

Umiat

Chandler River

Anaktuvuk River

Dalton Highway

Colville River

Arctic National Wildlife Refuge

RANGE

BROOKS

Anaktuvuk Pass

Arctic Village

Gates of the Arctic National Park

Noatak River

0 10 20 Miles

Subsistence Data

- Wildfowl, Lifetime previous to 1979 [a]
- Wildfowl, 1973-1986 [b]
- Eider and Geese, 1994-2003 [c]
- Ducks, Geese, Eggs and Upland Birds, 2014 [d]
- Overlapping Subsistence Use Areas Eider and Geese, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.7

Subsistence Data
- Vegetation, 1973-1986 [a]
- Berries, 1994-2003 [b]
- Berries and Plants, 2014 [c]

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

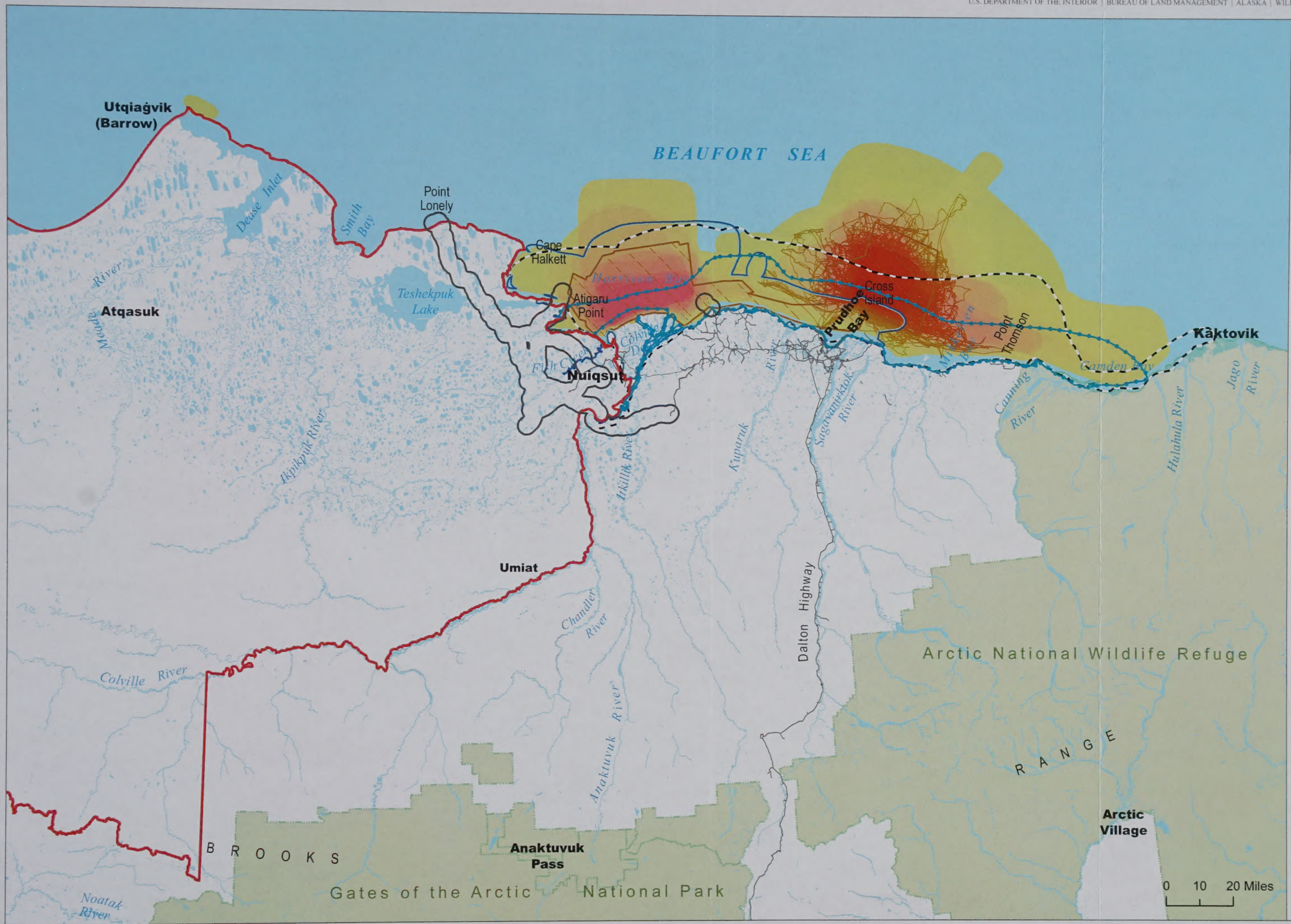
Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1986
b. BLM 2004
c. Brown et al.2016

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.8



Subsistence Data

- Marine Mammals, Lifetime previous to 1979 [a]
- Marine Mammals, 1973-1986 [b]
- Seal, 1994-2003 [c]
- Marine Mammals, 2014 [d]
- Whale Hunting GPS Track, 2001-2016 [e]
- Overlapping Subsistence Use Areas Marine Mammals, 1995-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. Galginaitis 2017
f. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.9

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1.2.1.1.1 Direct Effects Analysis Area

Subsistence use of the **direct effects analysis area**, defined as the area within 2.5 miles of Project infrastructure, is relatively high. Analyses specific to the direct effects analysis area are based primarily on *Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow* for the 1995-2006 time period (SRB&A 2010b) and the Nuiqsut Caribou Subsistence Monitoring Project for the 2008-2019 time period (SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2018; SRB&A 2019, 2020, 2021). For the 1995–2006 time period, use areas overlapping the direct effects analysis area accounted for 40% of all use areas documented for Nuiqsut harvesters (Table E.16.1). Across 12 years of the Nuiqsut Caribou Subsistence Monitoring Project (2008–2019), over half (53%) of the caribou use areas overlapped the direct effects analysis area. Areas located within the direct effects analysis area include overland areas to the west, south, and southeast of the community; coastal boating areas to the west and east of the CRD; and riverine boating areas along the Colville and Itkillik rivers and Fish Creek.

Table E.16.1. Nuiqsut Use Areas within the Direct Effects Analysis Area*

Source	Resource Type	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Analysis Area
SRB&A 2010b	All resources	1995–2006	758	304 (40%)
SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021	Caribou	2008–2019	2,161	1,145 (53%)

As shown in Figures E.16.1 through E.16.9, Nuiqsut harvesters have reported using the direct effects analysis area to harvest the following resources during one or more study years: caribou, moose, other large land mammals, furbearers and small land mammals, fish, birds, vegetation, and marine mammals. Resources that overlap during most study years include caribou, furbearers and small land mammals, fish, and marine mammals. While some resources overlap with a large proportion of the direct effects analysis area (e.g., caribou, furbearers and small land mammals), others overlap with smaller portions of the area, such as where the direct effects analysis area intersects with fishing or hunting areas along Fish (Iqalliqpik) Creek and the Colville River (e.g., fish, birds) or in offshore waters near Atigaru Point or Oliktok Point (e.g., marine mammals).

1.2.1.2 Harvest and Use Data

Tables E.16.2 and E.16.3 provide Nuiqsut harvest data for various years between 1985 and 2019; data are not available for all years within this time period because harvest studies were not conducted in all years. While certain studies address all resources (all resources study years), others address individual species or resources (single-resource study years). Eleven study years only include data on caribou harvests (Braem, Kaleak et al. 2011; SRB&A 2012, 2013, 2014, 2015, 2016, 2017a, 2018; SRB&A 2019, 2020, 2021) (Table E.16.3). During available study years, Nuiqsut households have harvested between 399 (in 1985, one of two years when the community did not successfully harvest a bowhead whale) and 896 (in 2014) pounds of subsistence resources per capita (Table E.16.2). Land mammals, marine mammals, and fish are all major subsistence resources in Nuiqsut. During 4 study years, marine mammals contributed more total edible pounds than any other resource. Non-salmon fish were the top harvested resource during the remaining 3 study years and accounted for between 173 (in 1985) and 248 (in 1993) edible pounds per capita during years with per capita harvest data. Large land mammals were generally the second- or third-most harvested resource during all study years and provided between 169 (in 1985) and 261 (in 2014) edible pounds per capita. Nuiqsut residents harvest other resources such as migratory birds, upland game birds, salmon, bird eggs, and vegetation in much smaller quantities. Small land mammals are also harvested, but because they are harvested primarily for their fur, they contribute little in the way of edible pounds.

In terms of species, bowhead whales, whitefish (Arctic cisco, or *qaaktaq*, and broad whitefish), and caribou are the primary subsistence species harvested in Nuiqsut. Bowhead whale harvests have accounted for between 28.7% and 60.3% of the total harvest during all study years (except for 1985 and 1994–1995, when Nuiqsut did not successfully harvest a bowhead whale) (Table E.16.3). Arctic cisco harvests have accounted for between 1.9% and 14.9% of the total harvest; broad whitefish have accounted for between 5.3% and 45% of the total harvest; and caribou have accounted for between 21.7% and 37.5% of the total harvest. Other subsistence species with substantial contributions to Nuiqsut subsistence harvests include moose, seals, goose, Arctic grayling, least cisco, and burbot.

Data on subsistence participation and use by Nuiqsut households are available for various study years (Tables E.16.2 and E.16.3). As shown in Table E.16.2, 100% of households report using subsistence resources during study years, and over 90% of households participate in subsistence activities (i.e., attempting to harvest). Across all study years, participation in subsistence activities was highest for non-salmon fish, large land mammals, and

migratory birds. Specifically, in 2014, over half of Nuiqsut households participated in harvests of caribou, broad whitefish, white-fronted goose, cloudberries, and Arctic cisco. In 2019, 98% of households participated in caribou hunting activities. Sharing of subsistence resources, a core Iñupiat value, is also high among Nuiqsut households; between 95% and 100% of households report receiving subsistence foods during available study years. In particular, households commonly share marine mammals (between 95% and 100% of households receiving), large land mammals (between 70% and 92% receiving), and non-salmon fish (between 71% and 90% receiving).

Table E.16.2. Nuiqsut Subsistence Harvest Estimates by Resource Category, All Resources Study Years

Study Year	Resource	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1985	All resources	100	98	98	95	100	–	160,035	2,106	399	100.0
1985	Salmon	60	43	40	23	23	441	1,366	18	3	0.9
1985	Non-salmon fish	100	93	93	83	75	67,712	69,243	911	173	43.3
1985	Large land mammals	98	90	90	80	70	536	67,621	890	169	42.3
1985	Small land mammals	65	63	58	23	13	688	245	3	1	0.2
1985	Marine mammals	100	48	23	30	100	59	13,355	176	33	8.3
1985	Migratory birds	90	90	85	60	55	1,733	6,626	87	17	4.1
1985	Upland game birds	88	88	88	58	13	1,957	1,370	18	3	0.9
1985	Bird eggs	25	25	23	8	10	262	40	1	<1	<0.1
1985	Vegetation	38	50	18	10	20	–	169	2	<1	0.1
1992[c]	All resources	–	–	–	–	–	–	150,195	–	–	100.0
1992[c]	Salmon	–	–	–	–	–	6	65	–	–	0.0
1992[c]	Non-salmon fish	–	74	–	–	–	36,701	51,890	–	–	34.5
1992[c]	Large land mammals	–	–	–	–	–	299	41,386	–	–	27.6
1992[c]	Small land mammals	–	–	–	–	–	46	1	–	–	0.0
1992[c]	Marine mammals	–	–	–	–	–	49	52,865	–	–	35.2
1992[c]	Migratory birds	–	–	–	–	–	1,105	3,655	–	–	2.4
1992[c]	Upland game birds	–	–	–	–	–	378	265	–	–	0.2
1992[c]	Eggs	–	–	–	–	–	25	4	–	–	<0.1
1992[c]	Vegetation	–	32	–	–	–	–	66	–	–	<0.1
1993	All resources	100	94	90	92	98	–	267,818	2,943	742	100.0
1993	Salmon	71	45	36	39	47	272	1,009	11	3	0.4
1993	Non-salmon fish	97	79	79	87	90	71,626	89,481	983	248	33.4
1993	Large land mammals	98	76	74	82	92	691	87,306	959	242	32.6
1993	Small land mammals	53	45	42	27	18	599	84	1	<1	<0.1
1993	Marine mammals	97	58	37	79	97	113	85,216	936	236	31.8
1993	Migratory birds	87	74	73	63	65	2,238	3,540	39	10	1.3
1993	Upland game birds	60	45	45	42	26	973	681	7	2	0.3
1993	Eggs	40	21	19	15	23	346	104	1	<1	<0.1
1993	Vegetation	79	71	71	27	40	–	396	4	1	0.1
1994–1995[d]	All resources	–	–	–	–	–	–	83,228	–	–	100.0
1994–1995[d]	Salmon	–	–	–	–	–	10	31	–	–	<0.1
1994–1995[d]	Non-salmon fish	–	–	–	–	–	15,190	46,569	–	–	56.0
1994–1995[d]	Large land mammals	–	–	–	–	–	263	32,686	–	–	39.3
1994–1995[d]	Small land mammals	–	–	–	–	–	42	0	–	–	0.0
1994–1995[d]	Marine mammals	–	–	–	–	–	25	1,504	–	–	1.8
1994–1995[d]	Migratory birds	–	–	–	–	–	569	2,289	–	–	2.8
1994–1995[d]	Upland game birds	–	–	–	–	–	58	58	–	–	0.1
1994–1995[d]	Vegetation	–	–	–	–	–	14	91	–	–	0.1

Study Year	Resource	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1995–1996	All resources	–	–	–	–	–	–	183,576	–	–	100.0
1995–1996	Salmon	–	–	–	–	–	42	131	–	–	0.1
1995–1996	Non-salmon fish	–	–	–	–	–	10,612	16,822	–	–	9.2
1995–1996	Large land mammals	–	–	–	–	–	364	43,554	–	–	23.7
1995–1996	Small land mammals	–	–	–	–	–	27	0	–	–	0.0
1995–1996	Marine mammals	–	–	–	–	–	178	120,811	–	–	65.8
1995–1996	Migratory birds	–	–	–	–	–	683	2,166	–	–	1.2
1995–1996	Upland birds	–	–	–	–	–	19	13	–	–	<0.1
1995–1996	Vegetation	–	–	–	–	–	12	78	–	–	<0.1
2000–2001	All resources	–	–	–	–	–	–	183,246	–	–	100.0
2000–2001	Salmon	–	–	–	–	–	10	75	–	–	<0.1
2000–2001	Non-salmon fish	–	–	–	–	–	26,545	27,933	–	–	15.2
2000–2001	Large land mammals	–	–	–	–	–	504	62,171	–	–	33.9
2000–2001	Small land mammals	–	–	–	–	–	108	2	–	–	<0.1
2000–2001	Marine mammals	–	–	–	–	–	31	87,929	–	–	48.0
2000–2001	Migratory birds	–	–	–	–	–	1,192	5,108	–	–	2.8
2000–2001	Upland birds	–	–	–	–	–	23	16	–	–	<0.1
2000–2001	Vegetation	–	–	–	–	–	2	13	–	–	<0.1
2014	All resources	100	95	90	91	97	–	371,992	3,444	896	100.0
2014	Salmon	64	41	40	31	35	–	3,889	36	9	1.0
2014	Non-salmon fish	93	78	71	72	71	–	85,106	788	205	22.9
2014	Large land mammals	91	66	64	67	72	–	108,359	1,003	261	29.1
2014	Small land mammals	17	16	10	2	7	–	0	0	0	0.0
2014	Marine mammals	95	55	40	71	95	–	169,367	1,568	408	45.5
2014	Migratory birds	79	71	66	52	38	–	4,742	44	11	1.3
2014	Upland birds	16	12	12	9	5	–	78	1	<1	<0.1
2014	Vegetation	67	55	53	21	38	–	414	4	1	0.1

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995a); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016)

Note: "–" (No Data). "All Resources" study years are years where studies addressed all subsistence resources harvested by the community, rather than selected resources or species. The estimated harvest numbers for the 1994–1995, 1995–1996, and 2000–2001 data were derived by summing individual species in each resource category. Also for those study years, total pounds were derived from conversion rates found at ADF&G (2018), and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo et al. (n.d.).

[a] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons.

[b] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

[c] The estimated pounds of moose harvested in 1992 is likely too high (Fuller and George 1999).

[d] The 1994–1995 study year underrepresents the harvest of Arctic cisco and humpback whitefish (Brower and Hepa 1998); Nuiqsut did not successfully harvest a bowhead whale in 1994–1995.

Table E.16.3. Nuiqsut Subsistence Harvest Estimates by Selected Species, All Study Years*

Study Year	Resource[a]	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1985	Caribou	98	90	90	80	60	513	60,021	790	150	37.5
1985	Cisco	98	75	73	65	60	46,478	29,354	386	73	18.3
1985	Broad whitefish	95	80	78	70	40	7,900	26,861	353	67	16.8
1985	Bowhead whale	100	23	5	8	100	0	7,458	98	19	4.7
1985	Moose	40	40	18	20	25	13	6,650	88	17	4.2
1985	White-fronted goose	90	90	85	55	48	1,340	6,028	79	15	3.8
1985	Arctic grayling	78	65	63	48	35	4,055	3,650	48	9	2.3
1985	Humpback whitefish	48	45	38	33	13	4,345	3,476	46	9	2.2
1985	Arctic char	75	63	60	33	35	1,060	2,969	39	7	1.9
1985	Burbot	75	60	60	43	33	669	2,675	35	7	1.7
1985	Bearded seal	48	25	15	15	35	15	2,675	35	7	1.7
1985	Ringed seal	53	25	18	23	40	40	1,676	22	4	1.0
1992	Bowhead whale	–	–	–	–	–	2	48,715	–	–	32.4
1992	Caribou	–	81	–	–	–	278	32,551	–	–	21.7
1992	Arctic cisco	–	–	–	–	–	22,391	22,391	–	–	14.9
1992	Broad whitefish	–	–	–	–	–	6,248	15,621	–	–	10.4
1992	Moose[d]	–	–	–	–	–	18	8,835	–	–	5.9
1992	Humpback whitefish	–	–	–	–	–	1,802	4,504	–	–	3.0
1992	Arctic char	–	–	–	–	–	1,544	4,324	–	–	2.9
1992	Bearded seal	–	–	–	–	–	16	2,760	–	–	1.8
1992	Arctic grayling	–	–	–	–	–	3,114	2,491	–	–	1.7
1992	Canada goose	–	–	–	–	–	319	1,437	–	–	1.0
1993	Caribou	98	74	74	79	79	672	82,169	903	228	30.7
1993	Bowhead whale	97	37	5	76	97	3	76,906	845	213	28.7
1993	Broad whitefish	90	66	66	65	66	12,193	41,455	456	115	15.5
1993	Arctic cisco	89	69	68	81	60	45,237	31,666	348	88	11.8
1993	Ringed seal	65	42	31	40	55	98	7,277	80	20	2.7
1993	Burbot	79	63	57	53	55	1,416	5,949	65	16	2.2
1993	Moose	69	47	10	29	63	9	4,403	48	12	1.6
1993	Arctic grayling	79	69	65	44	27	4,515	4,063	45	11	1.5
1993	Least cisco	63	52	47	36	27	6,553	3,277	36	9	1.2
1994–1995[e]	Broad whitefish	–	–	–	–	–	3,237	37,417	–	–	45.0
1994–1995[e]	Caribou	–	–	–	–	–	258	30,186	–	–	36.3
1994–1995[e]	Arctic cisco	–	–	–	–	–	9,842	6,889	–	–	8.3
1994–1995[e]	Moose	–	–	–	–	–	5	2,500	–	–	3.0
1994–1995[e]	Goose, unidentified	–	–	–	–	–	474	2,133	–	–	2.6
1994–1995[e]	Ringed seal	–	–	–	–	–	24	1,008	–	–	1.2
1995–1996	Bowhead whale	–	–	–	–	–	4	110,715	–	–	60.3
1995–1996	Caribou	–	–	–	–	–	362	42,354	–	–	23.1
1995–1996	Broad whitefish	–	–	–	–	–	2,863	9,735	–	–	5.3
1995–1996	Ringed seal	–	–	–	–	–	155	6,527	–	–	3.6
1995–1996	Arctic cisco	–	–	–	–	–	5,030	3,521	–	–	1.9
1995–1996	Bearded seal	–	–	–	–	–	17	2,974	–	–	1.6
1995–1996	Least cisco	–	–	–	–	–	1,804	1,804	–	–	1.0
1999–2000	Caribou	–	–	–	–	–	413	–	–	112	–
2000–2001	Bowhead whale	–	–	–	–	–	4	86220	–	–	47.1
2000–2001	Caribou	–	–	–	–	–	496	57,985	–	–	31.6
2000–2001	Arctic cisco	–	–	–	–	–	18,222	12,755	–	–	7.0
2000–2001	Broad whitefish	–	–	–	–	–	2,968	10,092	–	–	5.5
2000–2001	White-fronted goose	–	–	–	–	–	787	3,543	–	–	1.9
2000–2001	Moose	–	–	–	–	–	6	3,000	–	–	1.6
2002–2003	Caribou	95	47	45	49	80	397	–	–	118	–
2003–2004	Caribou	97	74	70	81	81	564	–	–	157	–
2004–2005	Caribou	99	62	61	81	96	546	–	–	147	–
2005–2006	Caribou	100	60	59	97	96	363	–	–	102	–

Study Year	Resource[a]	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
2006–2007	Caribou	97	77	74	66	69	475	–	–	143	–
2010	Caribou	94	86	76	–	–	562	65,754	707	–	–
2011	Caribou	92	70	56	49	58	437	51,129	544	134	–
2012	Caribou	99	68	62	65	79	501	58,617	598	147	–
2013	Caribou	95	79	63	62	75	586	68,534	692	166	–
2014	Bowhead	93	29	21	57	91	5	148,087	1,371	357	39.8
2014	Caribou	90	66	64	67	59	774	105,193	974	253	28.3
2014	Broad whitefish	72	60	59	52	40	11,439	36,605	339	88	9.8
2014	Arctic cisco	83	52	48	59	53	46,277	32,394	300	78	8.7
2014	Bearded seal	67	38	22	40	62	13,846	13,846	128	33	3.7
2014	Least cisco	33	28	28	19	7	13,332	9,333	86	22	2.5
2014	Ringed seal	52	40	35	38	33	108	6,156	57	15	1.7
2015	Caribou	96	84	78	74	72	621	72,631	719	178	–
2016	Caribou	96	76	67	73	73	489	56,277	592	132	–
2017	Caribou	96	72	60	74	85	635	74,338	715	164	–
2018	Caribou	99	84	74	88	88	608	71,113	658	157	–
2019[f]	Caribou	100	98	91	87	78	636	74,439	658	153	–

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995a); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 1999–2000, 2002–2007 (Braem, Kaleak et al. 2011); 2010, 2011, 2012, 2013 (SRB&A 2012, 2013, 2014, 2015); 2014 (Brown, Braem et al. 2016); 2015, 2016, 2017, 2018, 2019 (SRB&A 2017a, 2018; SRB&A 2019, 2020, 2021).

Note: "–" (No Data). For all resources study years (1985, 1992, 1993, 1994–1995, 1995–1996, 2000–2001), species are listed in descending order by percentage of the total harvest and are limited to species accounting for at least 1.0% of the total harvest; for single-resource study years, species are listed in descending order by total estimated pounds (or total number harvested, in the case of salmon study years) and limited to the five top species. Years lacking "percentage of total harvest" data were not comprehensive (i.e., all resources) study years. The estimated harvest numbers for the 1992, 1994–1995, 1995–1996, and 2000–2001 data were derived by summing individual species in each resource category. Also, for those study years, total pounds were derived from conversion rates found at ADF&G (2018) and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo et al. (n.d.). For the 2002–2003, 2003–2004, 2004–2005, 2005–2006, 2006–2007, 2010, and 2011 study years, total pounds were derived from conversion rates from (Braem, Kaleak et al. 2011).

[a] This table shows individual species unless they are not available for a given study year.

[b] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons.

[c] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

[d] The estimated pounds of moose harvested in 1992 is likely too high (Fuller and George 1999).

[e] The 1994–1995 study year underrepresents the harvest of Arctic cisco and humpback whitefish (Brower and Hepa 1998); Nuiqsut did not successfully harvest a bowhead whale in 1994–1995.

[f] This study year had a low response rate due to COVID-19; thus, results and community-wide estimates should be viewed with this in mind.

1.2.1.2.1 Direct Effects Analysis Area

Nuiqsut residents harvest various resources within the direct effects analysis area, including caribou, furbearers (wolf and wolverine), seal, goose, eiders, and fish (broad whitefish and burbot). As shown in Tables E.16.2 and E.16.3, caribou are among the top species harvested, in terms of edible weight, by the community of Nuiqsut, as are broad whitefish. During most years, over half of Nuiqsut households participate in the harvests of these resources. Seals, particularly bearded seals, are another important resource that is harvested within the direct effects analysis area. Although not harvested in the same quantities as resources such as caribou and broad whitefish, seals are hunted by a substantial proportion of households (Table E.16.2). Similarly, while migratory birds generally account for less than 5% of the total annual harvest, a high percentage of households participate in harvests of these resources (between 70% and 90% across available study years; Table E.16.2). Wolf and wolverine hunting is an important, specialized activity that is practiced by a more limited subset of the community but which provides income and supports traditional crafts (e.g., providing skins and furs for sewing, craft making, and clothing).

Harvest amounts specific to the direct effects analysis area are available only for caribou. These data show the percentage of the reported caribou harvest that came from the direct effects analysis area between 2008 and 2019. These data represent only the harvests reported by a sample of active harvesters interviewed during each study

year and are not based on the total estimated community harvest; thus, other harvests may have occurred within the direct effects analysis area during the study.

As shown in Table E.16.4, across 12 years of the Nuiqsut Caribou Subsistence Monitoring Project, between 14% and 36% of the annual caribou harvests have occurred within the direct effects analysis area. As noted above, residents often travel to the west of their community to hunt caribou by four-wheeler or snow machine in an area east and south of the direct effects analysis area. Caribou often travel through the analysis area before arriving in hunting areas closer to the community.

Table E.16.4. Nuiqsut Caribou Harvests Within the Direct Effects Analysis Area, 2008–2019*

Study Year	Percentage of Caribou Harvests within Direct Effects Analysis Area
Year 1 (2008)	20
Year 2 (2009)	17
Year 3 (2010)	16
Year 4 (2011)	26
Year 5 (2012)	22
Year 6 (2013)	14
Year 7 (2014)	21
Year 8 (2015)	14
Year 9 (2016)	18
Year 10 (2017)	34
Year 11 (2018)	36
Year 12 (2019)	21

Source: (SRB&A 2021)

Based on data from SRB&A (2010b), which collected subsistence use area data for key resources for the 1995–2006 time period, the direct effects analysis area is used by a majority of wolf/wolverine hunters (100% during the 1995–2006 time period), caribou hunters (94%), moose hunters (94%), goose hunters (70%), and bearded seal hunters (56%) (Table E.16.5). In addition, a substantial percentage of harvesters use the direct effects analysis area for eider hunting (50%), ringed seal hunting (43%), and broad whitefish harvest (19%). For resources as a whole, the vast majority (97%) of Nuiqsut harvesters reported using the direct effects analysis area during the study period. Based on more recent caribou harvesting data for the 2008–2019 time period, on an annual basis, between 79% and 97% of respondents use the direct effects analysis area (Table E.16.6); thus, the area is a key caribou hunting ground for the community.

Table E.16.5. Percent of Nuiqsut Harvesters Using the Direct Effects Analysis Area, 1995–2006

Resource	Total Number of Respondents for Resource	Number of Respondents in Direct Effects Analysis Area	Percentage of Nuiqsut Resource Respondents
Caribou	32	30	94%
Wolverine	24	24	100%
Wolf	23	23	100%
Goose	33	23	70%
Bearded seal	27	15	56%
Ringed seal	23	10	43%
Eiders	28	14	50%
Broad whitefish	26	5	19%
Arctic char	26	4	15%
Moose	31	29	94%
Burbot	30	1	3%
All resources	**33**	**32**	**97%**

Source: SRB&A 2010b

Table E.16.6. Percent of Nuiqsut Caribou Harvesters Using the Direct Effects Analysis Area, 2008–2019*

Study Year	Number Using Direct Effects Analysis Area	Percentage Using Direct Effects Analysis Area	Total Respondents
Year 1	35	97%	36
Year 2	51	96%	53
Year 3	51	89%	57
Year 4	56	97%	58
Year 5	52	91%	57
Year 6	46	81%	57

Study Year	Number Using Direct Effects Analysis Area	Percentage Using Direct Effects Analysis Area	Total Respondents
Year 7	56	93%	60
Year 8	49	84%	58
Year 9	50	79%	63
Year 10	60	88%	68
Year 11	43	86%	50
Year 12	20	91%	22

Source: (SRB&A 2021)

1.2.1.3 Timing of Subsistence Activities

Table E.16.7 provides data on the timing of Nuiqsut subsistence activities based on studies from the 1970s through the 2010s. Overall, Nuiqsut harvesters target the highest numbers of resources, including non-salmon fish, caribou, moose and other large land mammals, seals and bowhead whales, and plants and berries, during August and September.

Table E.16.7. Nuiqsut Annual Cycle of Subsistence Activities

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon	M	L	M	M	L	L	M	H	H	H	H	L
Marine non-salmon	ND	ND	ND	ND	ND	ND	ND	ND	H	H	ND	ND
Salmon	ND	ND	ND	ND	ND	ND	H	M	ND	ND	ND	ND
Caribou	L	L	M	L	L	M	H	H	M	M	L	L
Moose	L	ND	ND	ND	ND	ND	L	H	H	M	L	L
Bear	M	M	M	L	L	L	L	L	H	M	M	M
Muskox	ND	ND	ND	ND	ND	ND	ND	H	H	H	ND	ND
Furbearers	H	H	H	H	M	L	L	L	L	L	M	H
Small land mammals	ND	ND	ND	ND	L	L	H	H	L	ND	ND	ND
Marine mammals	ND	ND	M	H	L	L	M	H	H	L	L	L
Upland birds	M	M	H	H	M	L	ND	L	L	M	M	M
Waterfowl	ND	ND	ND	L	H	H	M	M	M	M	L	L
Eggs	ND	ND	ND	ND	ND	H	ND	ND	ND	ND	ND	ND
Plants and berries	ND	ND	ND	ND	L	L	H	H	ND	ND	ND	ND
Total number of resource categories by month	**6**	**5**	**6**	**7**	**9**	**10**	**10**	**12**	**11**	**10**	**8**	**8**

Source: 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 2002–2007 (Braem, Kaleak et al. 2011); 1994–1995 (Brower and Hepa 1998); Pre-1979 (Brown 1979); 2014 (Brown, Braem et al. 2016); 2004 (EDAW Inc., Adams/Russel Consulting et al. 2008); 1992 (Fuller and George 1999); 2001–2012 (Galginaitis 2014); 1988 (Hoffman, Libbey et al. 1988); 1979 (Libbey, Spearman et al. 1979); 1995–2006 (SRB&A 2010b); 2008–2019 (SRB&A 2021)
Note: ND (no documented activity and/or harvests); L (limited activity and/or harvests); M (moderate activity and/or harvests); H (high activity and/or harvests).

The month of April marks the beginning of the spring waterfowl hunting season, which peaks in May and June. Some residents also harvest goose eggs after the birds begin nesting in June. Beginning as early as May (depending on the timing of breakup), residents travel by boat along the local river system and into the Beaufort Sea to harvest various resources, including caribou, waterfowl, seals, and fish. Caribou hunting occurs throughout the year, but with the most intensity during July and August. During this time, residents also set nets for broad whitefish in local river systems or harvest fish such as Arctic grayling and Dolly Varden with rods and reels, often while hunting caribou along the Colville River. Throughout the summer months, residents also travel to the ocean to hunt for ringed seals, bearded seals, and king and common eiders, with some coastal caribou hunting occurring as well (SRB&A 2010b). Most berry and plant gathering occurs in July and August.

Beginning in August and continuing throughout September, some residents shift their focus upriver in search of moose, with caribou often a secondary pursuit during these trips. Summer rod-and-reel harvests of non-salmon fish, particularly Arctic grayling, continue into the fall as well. Preparation for the bowhead whale hunt begins in August, with whaling crews generally traveling to Cross Island in September. While at Cross Island, Nuiqsut hunters may harvest polar bears and other marine resources; these harvesting events generally occur when whaling is not active due to weather or travel conditions. The fall Arctic cisco fishery, a major community event, may begin in September but is most productive between October and mid-November when the fish are running upriver; residents harvest them in the CRD with gillnets. Other fish, including humpback whitefish, broad whitefish, and least cisco, are caught incidentally during this time. Caribou are also harvested during October and November, as available, to the west of the community.

Starting in November and December and continuing through April, hunters pursue wolves and wolverines and target caribou and ptarmigan as needed and available. Residents may also fish for burbot through the ice during winter.

1.2.1.3.1 Direct Effects Analysis Area

Nuiqsut harvesters use the direct effects analysis area at varying levels throughout the year (Figure E.16.10). For all resources for the 1995–2006 time period, uses of the direct effects analysis area are somewhat consistent throughout the year but with a peak in summer (July and August) and again in mid-to late winter (January through March). During both the 1995–2006 and 2008–2019 time periods, caribou hunting in the direct effects analysis area peaked from July through September but continued through winter. Data from the more recent time period (2008–2019) show decreasing use of the direct effects analysis area in the winter months, consistent with the increasing use of ATVs instead of snow machines to access areas west of Nuiqsut (SRB&A 2021). Summer hunting activities in the direct effects analysis area occur in overland areas to the west of the community, along the Colville River, and, to a lesser extent, in coastal areas to the west and east of the CRD. Wolf and wolverine hunters use the direct effects analysis area solely during November through April, with goose hunting peaking in April and May and occurring to a lesser extent in June. Seal and eider hunting occur offshore primarily during the open-water months of June through September, although some eider hunting occurs as early as May. Fishing occurs in the direct effects analysis area between June and October, peaking in July and August, with minimal activity in November and December. Fishing occurs primarily along the Colville River and in Fish (Iqalliqpik) Creek.

1.2.1.4 Travel Methods

As shown in Table E.16.8, boat is the primary travel method used for subsistence pursuits of most resources, including various non-salmon fish, caribou, moose, bowhead whale, seals, and eider. Snow machine is the primary method of travel used for the late fall, winter, and early spring pursuits of Arctic cisco, burbot, wolf and wolverine, and goose; recent data shows that while boats remain the primary method of travel to caribou use areas, ATVs and trucks have become much more common in recent years, while snow machines have become less common (SRB&A 2021).

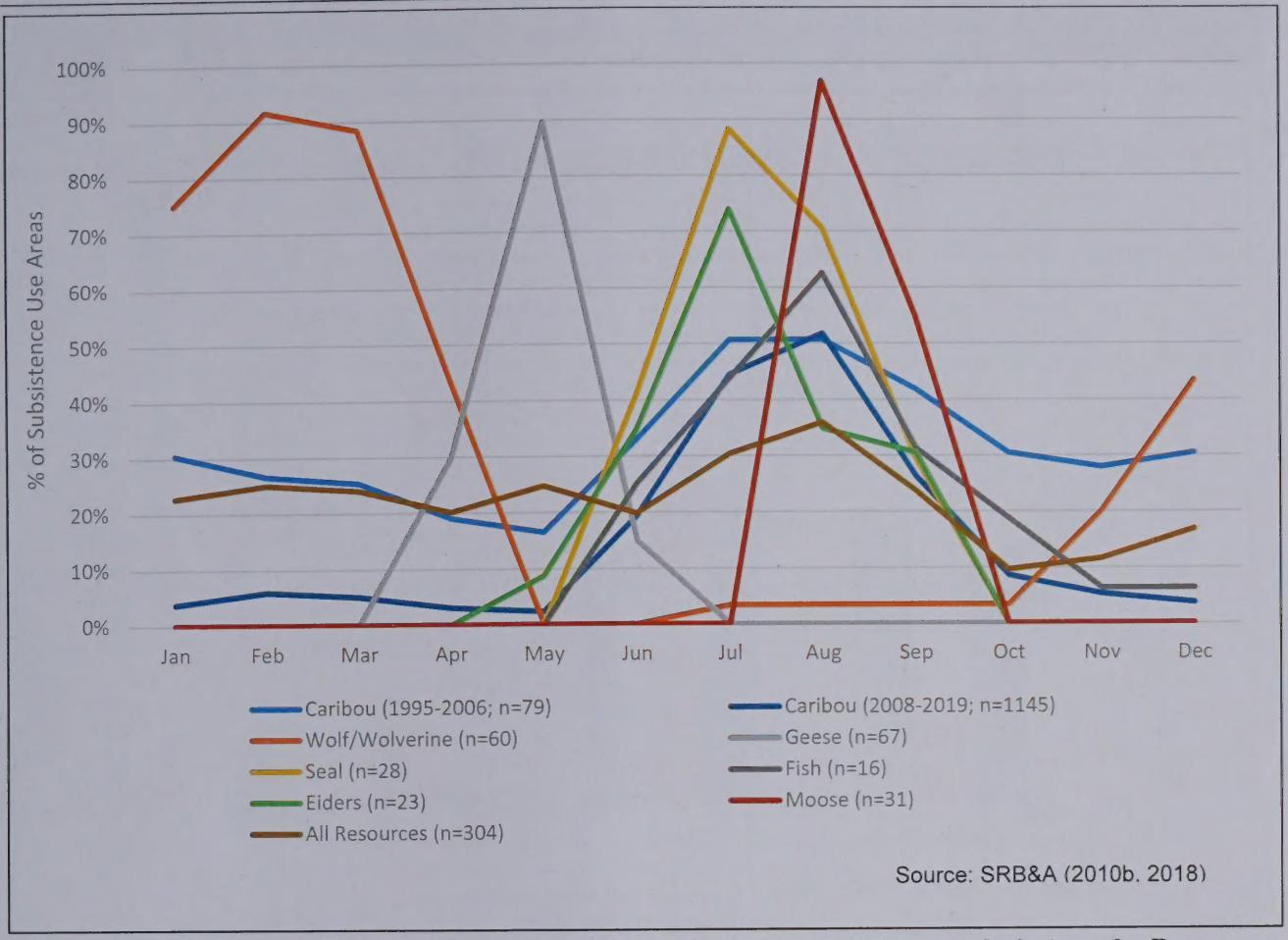

Figure E.16.10. Nuiqsut Subsistence Use Areas by Month in the Direct Effects Analysis Area, by Resource

Table E.16.8. Nuiqsut Travel Method to Subsistence Use Areas

Resource	Boat	Snow Machine	Foot	Car/Truck	ATV	Plane
Arctic cisco and burbot	L	H	L	M	ND	ND
Arctic char/Dolly Varden and broad whitefish	H	M	M	ND	ND	ND
Caribou	H	M	ND	L	M	ND
Moose	H	ND	M	ND	ND	ND
Wolf and wolverine	M	H	ND	ND	ND	M
Bowhead whale	H	ND	ND	ND	ND	ND
Seals	H	M	ND	ND	ND	ND
Goose	M	H	M	L	L	ND
Eider	H	M	ND	ND	ND	ND
Total number of resources targeted	**9**	**7**	**4**	**3**	**2**	**1**

Source: 1995–2006 (SRB&A 2010b); 2008–2019 (SRB&A 2021)
Note: ND (no documented use of travel method); ATV (all-terrain vehicle); L (limited use of travel method); M (moderate use of travel method); H (high use of travel method). Caribou based on SRB&A (2017a; 2021). All others based on SRB&A (2010a).

1.2.1.4.1 Direct Effects Analysis Area

Because the direct effects analysis area includes terrestrial, riverine, and marine areas, travel methods used by Nuiqsut harvesters vary by location. As shown in Figure E.16.11, for the 1995–2006 time period, snow machine was the primary method used to access the direct effects analysis area, followed closely by boat. No other travel methods were used (except minimally) within the direct effects analysis area. During the 2008–2019 time period, Nuiqsut caribou hunters primarily accessed the direct effects analysis area by boat (65% of use areas). A smaller percentage of use areas were accessed during that time period by snow machine (17%) or ATV (four-wheeler) (16%). Figure E.16.11 shows an increase in the use of ATVs in the direct effects analysis area during the 2008–2019 time period. Recent data from the Nuiqsut Caribou Subsistence Monitoring Project also show the increased

use of trucks to access caribou hunting areas west of the community due to the construction of easily accessible gravel roads (SRB&A 2021).

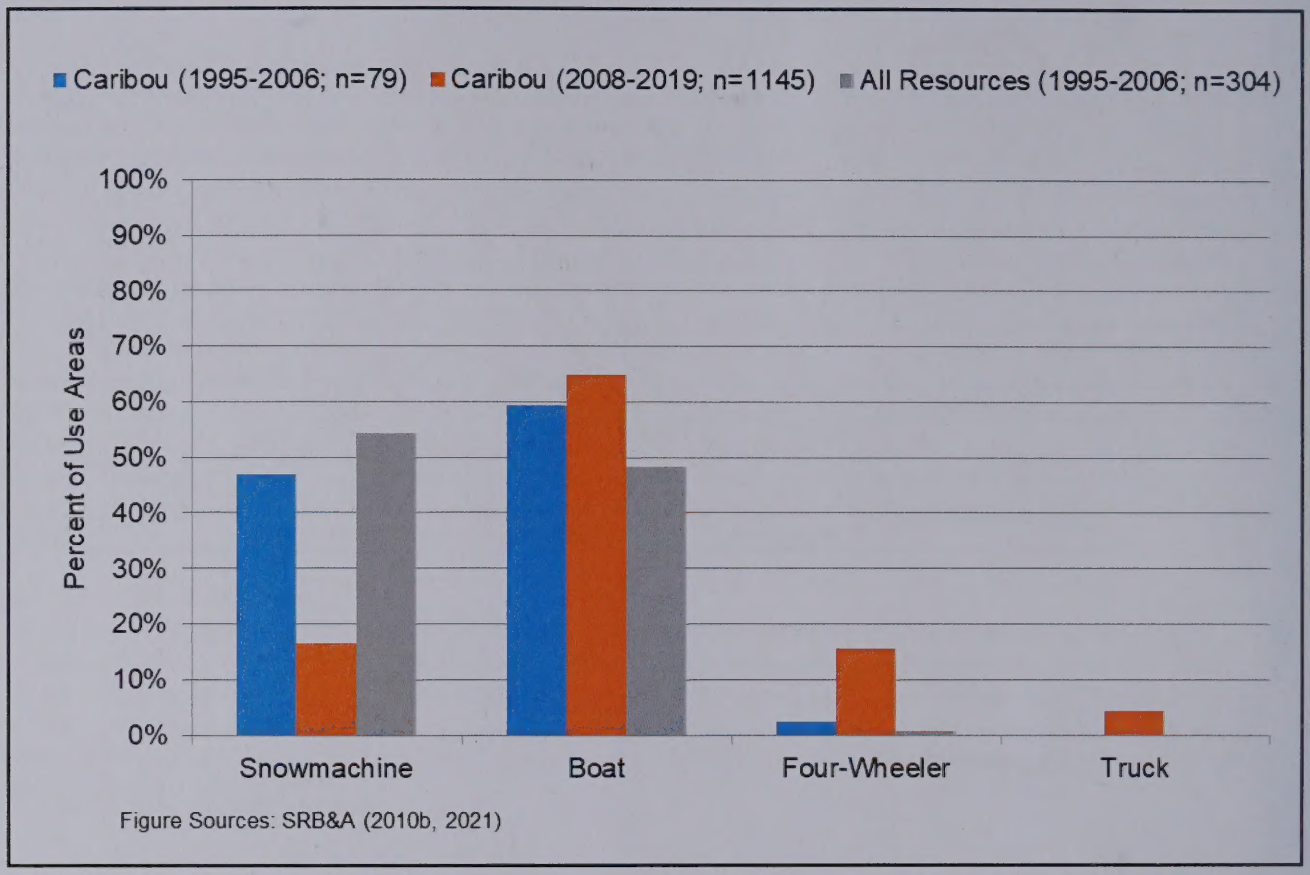

Figure E.16.11. Nuiqsut Travel Methods in the Direct Effects Analysis Area

1.2.1.5 Resource Importance

An analysis of resource importance based on harvest (average percentage of total harvest), harvest effort (average percentage of households attempting to harvest), and sharing (average percentage of households receiving) variables is provided in Table E.16.9. Based on this analysis, resources of major importance in Nuiqsut are Arctic cisco, Arctic grayling, bearded seal, bowhead whale, broad whitefish, burbot, caribou, cloudberry, white-fronted goose, and wood (driftwood).

Table E.16.9. Relative Importance of Subsistence Resources Based on Selected Variables, Nuiqsut

Resource Category	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Major resources[b]	Arctic cisco	61	57	8.8
Major resources[b]	Arctic grayling	50	24	1.0
Major resources[b]	Bearded seal	32	50	1.6
Major resources[b]	Bowhead whale[c]	30	96	30.4
Major resources[b]	Broad whitefish	69	49	15.5
Major resources[b]	Burbot	51	35	1.0
Major resources[b]	Caribou	75	77	29.9
Major resources[b]	Cloudberry	55	29	0.0
Major resources[b]	White-fronted goose	62	36	1.4
Major resources[b]	Wood[d]	50	3.2	0.0
Moderate resources[e]	Arctic char	38	22	0.9
Moderate resources[e]	Arctic fox	14	1	0.0
Moderate resources[e]	Beluga	2	24	0.0
Moderate resources[e]	Bird eggs	16	12	0.0
Moderate resources[e]	Blueberries	29	16	0.0
Moderate resources[e]	Brant	17	9	0.1

Resource Category	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Moderate resources[e]	Brown bear	14	18	0.2
Moderate resources[e]	Canada goose	42	24	0.4
Moderate resources[e]	Chum salmon	23	11	0.6
Moderate resources[e]	Ground squirrel	45	8	0.1
Moderate resources[e]	Humpback whitefish	26	9	1.0
Moderate resources[e]	King eider	24	19	0.0
Moderate resources[e]	Least cisco	40	17	1.1
Moderate resources[e]	Long-tailed duck	8	13	0.0
Moderate resources[e]	Moose	40	41	2.5
Moderate resources[e]	Pink salmon	28	17	0.4
Moderate resources[e]	Polar bear	7	29	0.2
Moderate resources[e]	Ptarmigan	48	15	0.2
Moderate resources[e]	Rainbow smelt	13	22	0.1
Moderate resources[e]	Red fox	22	2	0.0
Moderate resources[e]	Ringed seal	36	43	1.6
Moderate resources[e]	Snow goose	19	7	0.0
Moderate resources[e]	Spotted seal	13	5	0.1
Moderate resources[e]	Walrus	7	43	0.2
Moderate resources[e]	Wolf	18	6	0.0
Moderate resources[e]	Wolverine	22	5	0.0
Minor resources[f]	Arctic cod	7	7	0.0
Minor resources[f]	Chinook salmon	2	9	0.0
Minor resources[f]	Coho salmon	3	5	0.0
Minor resources[f]	Common eider duck	7	3	0.1
Minor resources[f]	Cranberries	9	5	0.0
Minor resources[f]	Crowberries	7	2	0.0
Minor resources[f]	Dall sheep	–	9	0.0
Minor resources[f]	Dolly Varden	10	3	0.4
Minor resources[f]	Lake trout	3	8	0.0
Minor resources[f]	Muskox	–	8	0.3
Minor resources[f]	Northern pike	7	7	0.0
Minor resources[f]	Northern pintail	5	1.6	0.0
Minor resources[f]	Round whitefish	5	1	0.1
Minor resources[f]	Saffron cod	7	–	0.0
Minor resources[f]	Sheefish	–	6	0.0
Minor resources[f]	Sockeye salmon	3	6	0.0
Minor resources[f]	Sourdock	5	7	0.0
Minor resources[f]	Weasel	5	–	0.0

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995b); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 1999–2000, 2002–2007 (Braem, Kaleak et al. 2011); 2010–2013, 2015-2019 (SRB&A 2021); 2014 (Brown, Braem et al. 2016)
Note: "–" (No Data).
[a] For space considerations, resources that contributed an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% of receiving resources are categorized as minor and are not shown.
[b] Major resources contribute > 9% of the total harvest, have ≥ 50% of households attempting to harvest, or have ≥ 50% of households receiving resources.
[c] Averages include unsuccessful bowhead whale harvest years.
[d] The inclusion of wood is based on a single study year (1993); data on wood were not collected during any other study year.
[e] Moderate resources contribute 2% to 9% of the total harvest, have 11% to 49% of households attempting to harvest, or have 11% to 49% of households receiving resources.
[f] Minor resources contribute < 2% of the total harvest, have ≤ 10% of households attempting to harvest, or have ≤ 10% of households receiving resource.

1.2.2 Utqiaġvik

Utqiaġvik (Barrow) is the North Slope's most populous community and is located on the northern coast of the Chukchi Sea. The town site is approximately 7.5 miles south of Point Barrow, the demarcation point between the Chukchi and Beaufort seas. In 2016, the residents of Barrow voted to formally rename the town to its original Iñupiaq name of Utqiaġvik. The community is also traditionally known as Ukpeagvik, which means "place where snowy owls are hunted" (NSB 2018). Continuous occupation of the Utqiaġvik area began approximately 1,300 years ago. Following European contact in the early 1800s, the growth of the commercial whaling and trapping industries brought Iñupiat from across the North Slope to Utqiaġvik in pursuit of employment and trade opportunities. The Naval Petroleum Reserve 4 was established in 1923, and in the late 1940s, the U.S. Navy established a base camp in Utqiaġvik from which to launch oil exploration in the reserve (Jensen 2009). The established mission of the naval base camp shifted away from oil exploration in the 1950s, and the base became the Naval Arctic Research Laboratory. Throughout the late 1900s, Utqiaġvik continued to grow as new economic

opportunities, including oil and gas exploration, arose on the North Slope. Today, Utqiaġvik is the headquarters for various regional organizations and corporations, including the NSB and the Arctic Slope Regional Corporation (NSB 2016). In 2020, the population of Utqiaġvik was estimated at 4,927 residents living in 1,334 occupied households; 63.4% were Alaska Native (USCB 2021). The community remains primarily Iñupiat, and subsistence remains an important part of the community's identity and social fabric.

1.2.2.1 Subsistence Use Areas

Figure E.16.12 depicts Utqiaġvik subsistence use areas for all resources for various historic and contemporary time periods (BLM 2004; Brown, Braem et al. 2016; Pedersen 1979; SRB&A 2010b, Unpublished; SRB&A and ISER 1993). Time periods range from lifetime use areas documented in 1979 (Pedersen 1979) to single-year use areas documented in 2014 (Brown, Braem et al. 2016). Lifetime (pre-1979) use areas include locations as far south as the Colville River near Umiat, beyond Nuiqsut in the east, offshore from the community to the southeast and southwest, and inland beyond Wainwright toward Point Lay. Harvest sites and use areas for the 1987–1989 time period are similar to those recorded for the pre-1979 time period but extend farther offshore from the community. The harvest sites for the 1987–1989 time period are concentrated in offshore areas between Peard Bay and Smith Bay and onshore areas extending south from the community beyond the Colville River and into the foothills of the Brooks Range. More recent use areas studies for the 1994–2003 and 1997–2006 time periods show somewhat larger use area extents, with use areas extending well offshore to the north of the community, east toward the Kuparuk River area, south to the Colville River, and as far west as Point Lay. Overlapping subsistence use areas for the 1997–2006 time period show the greatest concentration of use areas occurring offshore from the community up to 20 miles and in an overland area south of the community and along the Chipp and Ikpikpuk rivers. Use areas for the 2014 time period are consistent with these areas of highest overlapping use. In addition, some isolated use areas were reported for the 2014 time period offshore from Icy Cape and near Point Lay.

Resource-specific use area maps for Utqiaġvik are shown in Figures E.16.13 through E.16.20 for the time periods mentioned above. Utqiaġvik subsistence use areas for large land mammals are shown in Figures E.16.13 through E.16.15. Caribou use areas (Figure E.16.13) cover an extensive area from Icy Cape to Prudhoe Bay and as far south as the Colville River. Caribou use areas for the 1997–2006 time period extend farther south and east than previous time periods; the highest number of overlapping caribou use areas extend in an overland area approximately 30 miles south of the community and along local river systems. Caribou use areas for the most recent time period (2014) are generally within those documented for the 1997–2006 time period. Figure E.16.14 depicts Utqiaġvik moose use areas, and for most time periods, shows use concentrated along the Colville River, where moose are more likely to be found. Use areas from the 1997–2006 and 2014 time periods indicate a considerably larger area extending between Utqiaġvik and the Colville River. Utqiaġvik use areas for other large land mammals (e.g., grizzly/brown bear, Dall sheep, and polar bear) are shown on Figure E.16.15. Polar bear use areas occur in the Chukchi Sea at distances of no more than 20 miles from shore, while grizzly bear use areas are concentrated in various inland areas bounded by Wainwright and the Kuk River in the west and the Ikpikpuk River in the east.

Utqiaġvik small land mammal use areas (Figure E.16.16) cover an extensive area from Point Lay to the Kuparuk River and beyond the Colville River in the south. The extent of furbearer and small land mammal use areas has expanded over time. Lifetime furbearer and small land mammal use areas cover areas from Wainwright in the west to Nuiqsut in the east, and as far south as the Colville River, while 1997–2006 use areas for wolf and wolverine extend beyond Icy Cape to Point Lay in the west, past Nuiqsut to the Kuparuk River in the east, and well beyond the Colville River in the south. High numbers of overlapping use areas occur south and east of the community toward the Colville River. Small land mammal use areas for the most recent time period (2014) occurred primarily along the Ikpikpuk River toward the Colville River.

Utqiaġvik fishing areas for all available time periods are depicted in Figure E.16.17 and show residents fishing across a large river and lake system to the south of the community, west to the Kuk River near Wainwright, and as far east as Teshekpuk Lake and the Colville River. Most time periods also show fish harvesting in coastal waters and lagoon systems in the Chukchi and Beaufort seas. More recent use areas from the 1994–2003, 1997–2006, and 2014 time periods occur along river and lake systems to the south and east of the community as far as the Teshekpuk Lake and upper Judy Creek areas.

Utqiaġvik use areas for birds (Figure E.16.18), including eiders and goose, are relatively consistent over time, although they extend considerably farther offshore during the 1997–2006 time period (SRB&A 2010b). Use areas are located offshore at a distance greater than 40 miles from the community, inland beyond Atqasuk in the west,

and east as far as Nuiqsut. Bird use areas from more recent time periods (1994–2003, 1997–2006, and 2014) are concentrated along the Meade, Chipp, and Ikpikpuk rivers. Utqiaġvik harvests of vegetation (including berries and plants) and wood are depicted in Figure E.16.19 for various time periods. Vegetation and wood harvests generally occur to the south and southeast of the community, in addition to coastal areas (primarily for driftwood). More recent use areas for the 2014 time period occur over a large area that extends southwest to Wainwright and southeast to the Ikpikpuk River. Several isolated berry and plant harvesting areas have also been reported as far as Point Lay and Colville River.

Utqiaġvik subsistence use areas for marine mammals are shown on Figure E.16.20 and occur at varying offshore distances in the Beaufort and Chukchi seas. The offshore extent of marine mammal use areas has grown over time. SRB&A's (2010b) 1997–2006 marine mammals use areas show Utqiaġvik residents traveling beyond Wainwright in the west and offshore more than 80 miles, with the highest numbers of overlapping use areas occurring between 10 and 25 miles from shore. During the 2014 time period, marine mammal use areas occurred between Icy Cape and Dease Inlet and up to approximately 40 miles from shore.

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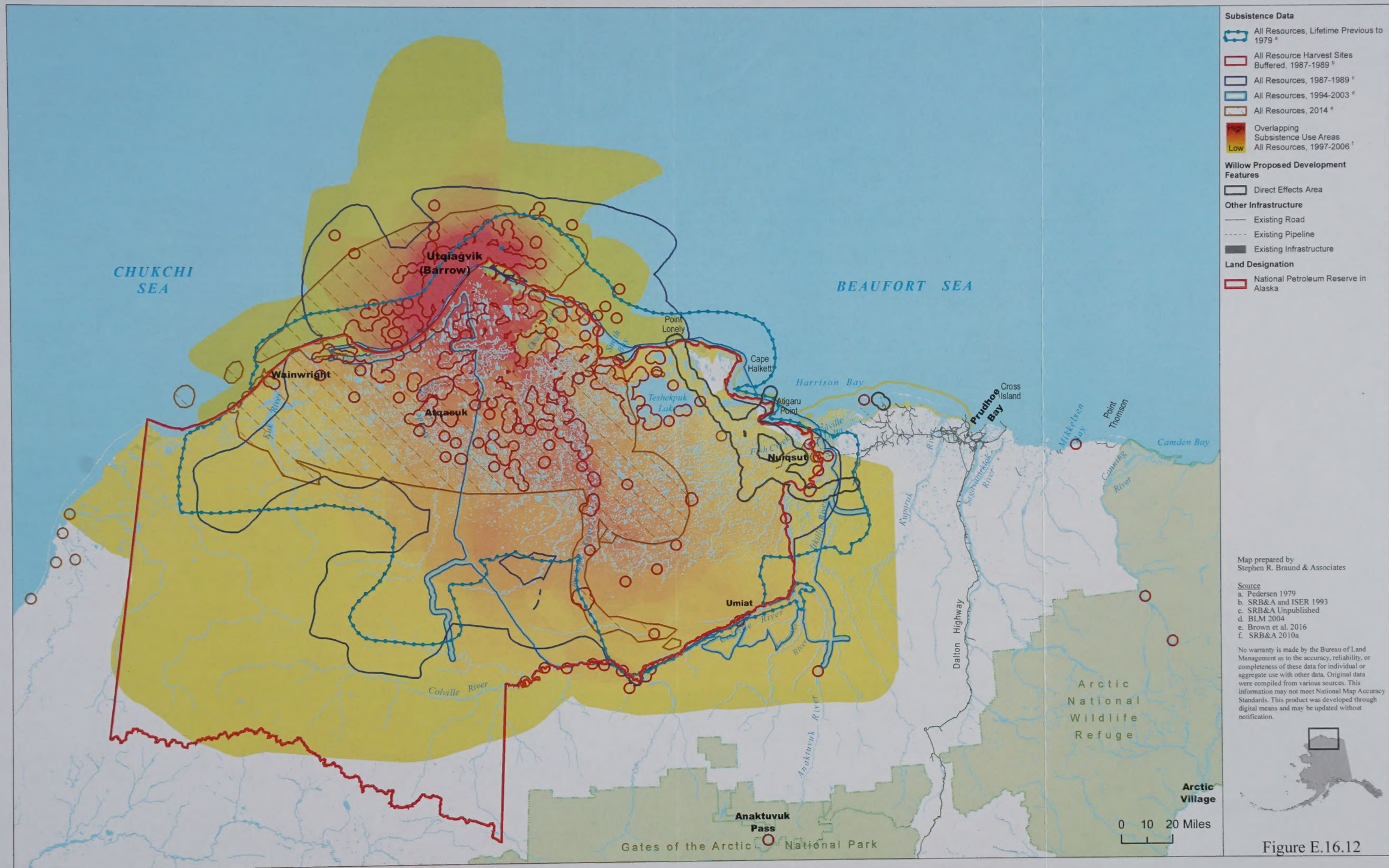
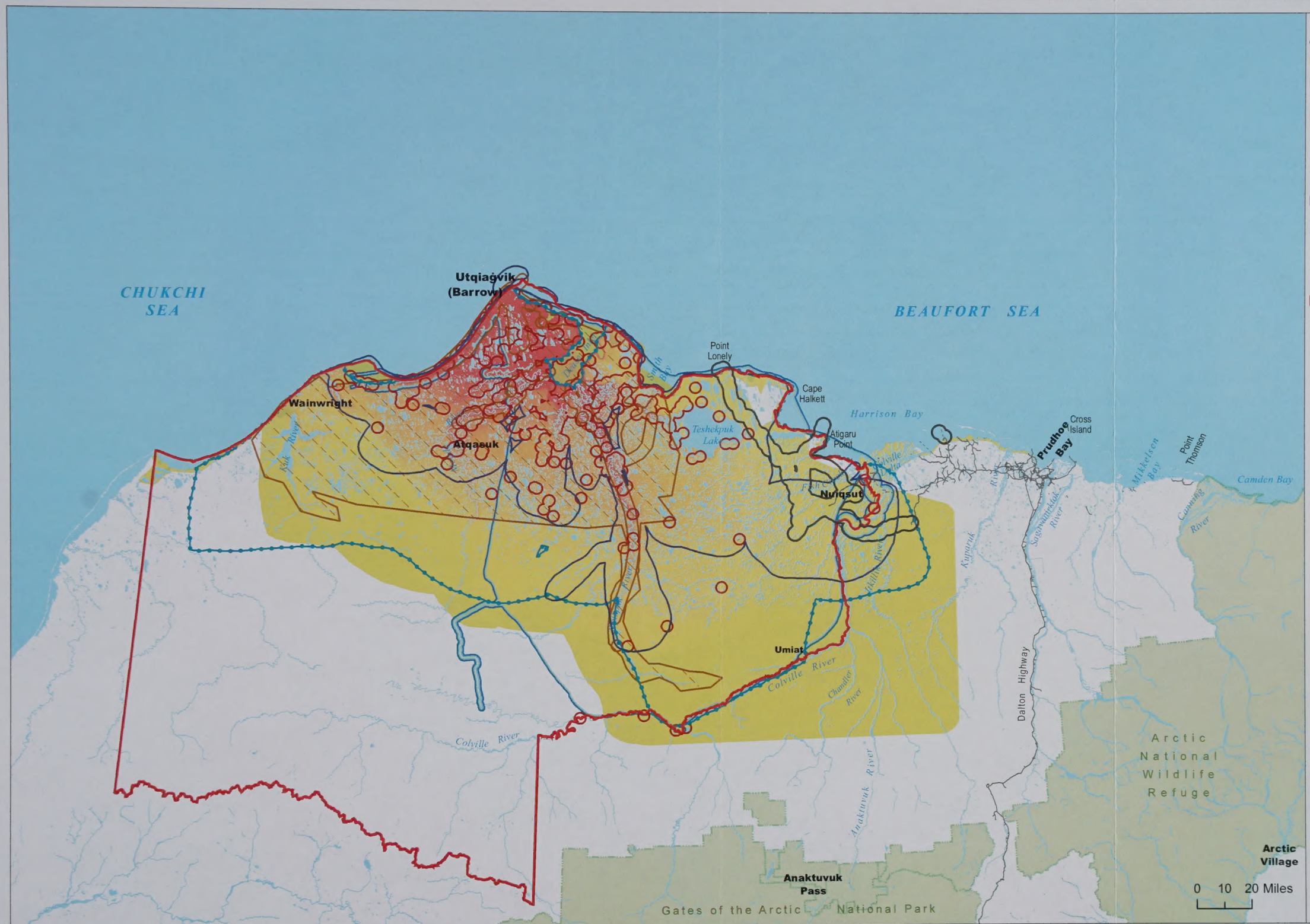


Figure E.16.12

Utqiaġvik (Barrow) Subsistence Use Areas, Caribou



Subsistence Data

- Caribou, Lifetime Prior to 1979 [a]
- Caribou Harvest Sites Buffered, 1987-1989 [b]
- Caribou, 1987-1989 [c]
- Caribou, 1994-2003 [d]
- Caribou, 2014 [e]
- Overlapping Subsistence Use Areas Caribou, 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

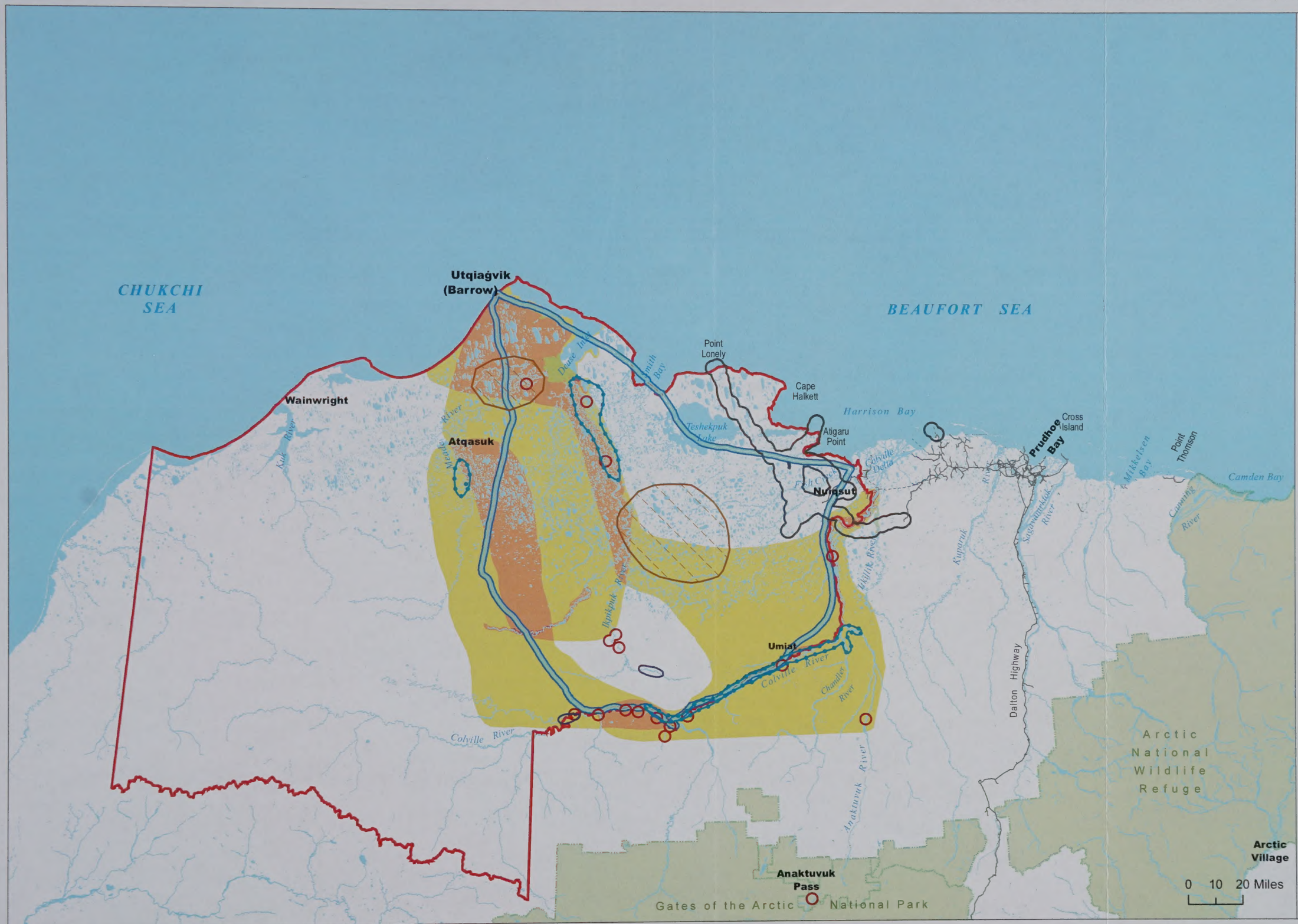
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.13



Subsistence Data

- Moose, Lifetime Previous to 1979 [a]
- Moose Harvest Sites Buffered, 1987-1989 [b]
- Moose, 1987-1989 [c]
- Moose, 1994-2003 [d]
- Moose, 2014 [e]
- Overlapping Subsistence Use Areas Moose, 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

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Figure E.16.14

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Nuiqsut

Umiat

Prudhoe Bay

Cross Island

Point Lonely

Cape Halkett

Atigaru Point

Point Thomson

Arctic Village

Dease Inlet

Smith Bay

Harrison Bay

Teshekpuk Lake

Colville Delta

Mikkelsen Bay

Camden Bay

Ikpikpuk River

Ublutuoch River

Kuparuk River

Sagavanirktok River

Colville River

Chandler River

Anaktuvuk River

Meade River

Ivik River

Dalton Highway

Arctic National Wildlife Refuge

Anaktuvuk Pass

Gates of the Arctic National Park

0 10 20 Miles

Subsistence Data

- Grizzly Bear and Polar Bear, Lifetime Previous to 1979 [a]
- Brown Bear, Dall Sheep and Polar Bear Harvest Sites Buffered, 1987-1989 [b]
- Brown Bear and Polar Bear, 1987-1989 [c]
- Brown Bear, 2014 [d]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. Brown et al. 2016

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Figure E.16.15

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Nuiqsut

Umiat

Prudhoe Bay

Cross Island

Point Thomson

Camden Bay

Dalton Highway

Arctic National Wildlife Refuge

Arctic Village

Anaktuvuk Pass

Gates of the Arctic National Park

Dease Inlet

Smith Bay

Teshekpuk Lake

Colville River

Itkillik River

Anaktuvuk River

Sagavanirktok River

Kuparuk River

Mikkelsen Bay

Canning River

0 10 20 Miles

Subsistence Data

- Furbearers, Small Land Mammals and Trapping, Lifetime Previous to 1979 [a]
- Furbearer and Small Land Mammal Harvest Sites Buffered, 1987-1989 [b]
- Furbearer and Small Land Mammals, 1987-1989 [c]
- Wolf and Wolverine, 1994-2003
- Small Land Mammals, 2014
- Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

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Figure E.16.16

Utqiaġvik (Barrow) Subsistence Use Areas, Fish

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Nuiqsut

Umiat

Point Lonely

Cape Halkett

Atigaru Point

Harrison Bay

Teshekpuk Lake

Colville Delta

Prudhoe Bay

Cross Island

Mikkelsen Bay

Point Thomson

Camden Bay

Kuk River

Meade River

Ikpikpuk River

Colville River

Chandler River

Itkillik River

Kuparuk River

Sagavanirktok River

Cumming River

Anaktuvuk River

Dalton Highway

Arctic National Wildlife Refuge

Arctic Village

Anaktuvuk Pass

Gates of the Arctic National Park

0 10 20 Miles

Subsistence Data

- Fishing, Lifetime Previous to 1979
- Fish, 1979-1983 [b]
- Fish Harvest Sites Buffered, 1987-1989 [c]
- All Fish, 1987-1989 [d]
- Fish, 1994-2003 [e]
- Fish, 1997-2006 [f]
- Non-Salmon and Salmon, 2014

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. BLM 2004
f. SRB&A 2010a
g. Brown et al. 2016

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Figure E.16.17

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Nuiqsut

Umiat

Arctic Village

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Prudhoe Bay

Cross Island

Point Thomson

Camden Bay

Dalton Highway

Arctic National Wildlife Refuge

Anaktuvuk Pass

Gates of the Arctic National Park

Smith Bay

Teshekpuk Lake

Colville Delta

Kuk River

Chipp River

Ikpikpuk River

Itkillik River

Kuparuk River

Sagavanirktok River

Mikkelsen Bay

Canning River

Chandler River

Anaktuvuk River

Colville River

0 10 20 Miles

Subsistence Data

- Wildfowl, Lifetime Previous to 1979 [a]
- Birds, 1979-1983 [b]
- Bird Harvest Sites Buffered, 1987-1989 [c]
- Birds, 1987-1989 [d]
- Geese, 1994-2003 [e]
- Birds, 2014 [f]
- Overlapping Subsistence Use Areas Eider and Geese, 1997-2006 [g] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. BLM 2004
f. Brown et al. 2016
g. SRB&A 2010a

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Figure E.16.18

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Nuiqsut

Prudhoe Bay

Cross Island

Point Thomson

Camden Bay

Umiat

Arctic Village

Anaktuvuk Pass

Gates of the Arctic National Park

Arctic National Wildlife Refuge

Dalton Highway

Colville River

Itkillik River

Kuparuk River

Sagavanirktok River

Canning River

Chandler River

Anaktuvuk River

Teshekpuk Lake

Fish Creek

Colville Delta

Smith Bay

Dease Inlet

Meade River

Kuk River

Miktelsen Bay

0 10 20 Miles

Subsistence Data

- Vegetation and Wood, Lifetime Previous to 1979 [a]
- Berry and Plant Harvest Sites Buffered, 1987-1989 [b]
- Berries, 1994-2003 [c]
- Berries and Plants, 2014 [d]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. BLM 2004
d. Brown et al. 2016

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Figure E.16.19

Utqiaġvik (Barrow) Subsistence Use Areas, Marine Mammals

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Nuiqsut

Umiat

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Teshekpuk Lake

Prudhoe Bay

Cross Island

Point Thomson

Camden Bay

Dalton Highway

Arctic National Wildlife Refuge

Arctic Village

Anaktuvuk Pass

Gates of the Arctic National Park

Colville River

Itkillik River

Anaktuvuk River

Chandler River

Ikpikpuk River

Kuk River

Meade River

Kuparuk River

Sagavanirktok River

Cumming River

Fish Creek

Colville Delta

Dease Inlet

Smith Bay

Mikkelsen Bay

0 10 20 Miles

Subsistence Data

- Marine Mammals, Lifetime Previous to 1979 [a]
- Marine Mammals, 1979-1983 [b]
- Marine Mammal Harvest Sites Buffered, 1987-1989 [c]
- Marine Mammals, 1987-1989 [d]
- Marine Mammals, 2014 [e]
- Overlapping Subsistence Use Areas Marine Mammals, 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. Brown et al. 2016
f. SRB&A 2010a

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Figure E.16.20

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1.2.2.1.1 Direct Effects Analysis Area

Subsistence use of the direct effects analysis area, defined as the area within 2.5 miles of Project infrastructure, is limited among Utqiaġvik harvesters. For the 1995–2006 time period, use areas overlapping the direct effects analysis area accounted for only 3% of all use areas documented for Utqiaġvik harvesters (Table E.16.10).

Table E.16.10. Utqiaġvik Use Areas within the Direct Effects Analysis Area

Source	Resource Type	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Analysis Area
SRB&A 2010b	All resources	1995–2006	2,029	50 (3%)

In general, the direct effects analysis area is located in the northeastern periphery of Utqiaġvik's extensive subsistence use areas. Resource uses that overlap include caribou, moose, other large land mammals, furbearers and small land mammals, fish, birds, and marine mammals (Figures E.16.12 through E.16.20). Resources that overlap during a majority of study years include caribou, moose, and furbearers and small land mammals. While most resource uses overlap a smaller portion of the direct effects analysis area or overlap areas of low overlapping use, the direct effects analysis area is directly to the east of Teshekpuk Lake, which is an area of high subsistence activity for caribou, furbearers and small land mammals, and fish. In addition, the direct effects analysis area overlaps the Colville River upriver from the community of Nuiqsut, an area used by some Utqiaġvik harvesters for moose hunting during fall.

1.2.2.2 Harvest and Use Data

Tables E.16.11 through E.16.13 provide subsistence harvest data for Utqiaġvik. Intermittent subsistence harvest studies exist for Utqiaġvik harvests from 1987 through 2014, consisting of 10 comprehensive (i.e., all resources) studies (Tables E.16.11 and E.16.13) (Bacon, Hepa et al. 2009; Brown, Braem et al. 2016; Fuller and George 1999; SRB&A and ISER 1993) and four single-resource studies (Table E.16.12) (Naves and Braem 2014). Studies show Utqiaġvik households harvesting between 204 and 362 per capita pounds of subsistence resources during available study years. Marine mammals have contributed the highest amount toward the total subsistence harvests in Utqiaġvik (at least 50% of pounds of usable weight), followed by large land mammals (between 20% and 40% of pounds of usable weight). Non-salmon fish and migratory birds provided a smaller, but substantial, portion of the yearly harvest during most years. While bird harvests appear modest in terms of pounds, residents of Utqiaġvik harvest large numbers of both migratory and upland game birds. In 2014, Utqiaġvik residents harvested an estimated 19,049 migratory birds and 911 upland game birds. The single-resource bird harvest study from the mid-to-late 2000s shows varying levels of bird and egg harvests by Utqiaġvik residents from year to year (Table E.16.12).

In terms of species, bowhead whales have been the most harvested resource during all but 2 study years (1987 and 2014), providing between 28.4% and 64.4% of the subsistence harvest (Table E.16.13). Caribou was the second-most harvested resource during all but 2 study years, accounting for between 16.4% and 31.8% of Utqiaġvik harvests. Other species that have contributed highly to Utqiaġvik subsistence harvests over the study years include seal (bearded and ringed), walrus, whitefish (especially broad whitefish), white-fronted goose, eiders, polar bear, Arctic grayling, and moose. The most recent comprehensive study year (2014) also showed beluga and salmon (chum and sockeye) among the top 10 species harvested. Although only accounting for a small portion of Utqiaġvik's yearly harvest, vegetation (e.g., berries and plants), marine invertebrates (e.g., clams), and eggs are also harvested annually by Utqiaġvik residents.

Table E.16.11. Utqiaġvik Subsistence Harvest Estimates by Resource Category, All Resources Study Years

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1987	All resources	–	–	58	–	–	–	621,067	663	206	100.0
1987	Salmon	–	–	3	–	–	196	1,190	1	<1	0.2
1987	Non-salmon fish	–	–	–	–	–	45,367	67,262	72	22	10.8
1987	Large land mammals	–	–	–	–	–	1,660	213,777	228	71	34.4
1987	Small land mammals	–	–	–	–	–	233	58	<1	<1	<0.1
1987	Marine mammals	–	–	41	–	–	–	316,229	337	105	50.9
1987	Migratory birds	–	–	–	–	–	8,125	20,618	22	7	3.3
1987	Upland game birds	–	–	16	–	–	2,454	1,717	2	1	0.3
1987	Vegetation	–	–	3	–	–	–	216	<1	<1	<0.1
1988	All resources	–	–	50	–	–	–	614,669	656	204	100.0
1988	Salmon	–	–	1	–	–	80	490	1	<1	0.1
1988	Non-salmon fish	–	–	14	–	–	38,005	50,571	54	17	8.2
1988	Large land mammals	–	–	27	–	–	1,599	207,005	221	69	33.7
1988	Small land mammals	–	–	–	–	–	152	0	0	0	0.0
1988	Marine mammals	–	–	39	–	–	654	334,069	357	111	54.3
1988	Migratory birds	–	–	34	–	–	7,832	21,419	23	7	3.5
1988	Upland game birds	–	–	9	–	–	1,350	945	1	<1	0.2
1988	Vegetation	–	–	2	–	–	–	169	<1	<1	<0.1
1989	All resources	–	–	61	–	–	–	872,092	931	289	100.0
1989	Salmon	–	–	10	–	–	2,088	12,244	13	4	1.4
1989	Non-salmon fish	–	–	13	–	–	66,199	106,226	113	35	12.2
1989	Large land mammals	–	–	39	–	–	1,705	214,676	229	71	24.6
1989	Small land mammals	–	–	2	–	–	68	7	<1	0	<0.1
1989	Marine mammals	–	–	45	–	–	591	508,181	542	169	58.3
1989	Migratory birds	–	–	37	–	–	12,539	29,215	31	10	3.3
1989	Upland game birds	–	–	5	–	–	329	231	<1	<1	<0.1
1989	Vegetation	–	–	–	–	–	–	1,312	1	<1	0.2
1992[c]	All resources	–	–	–	–	–	–	1,363,738	–	–	100.0
1992[c]	Salmon	–	–	–	–	–	1,161	8,236	–	–	0.6
1992[c]	Non-salmon fish	–	–	–	–	–	50,596	87,769	–	–	6.4
1992[c]	Large land mammals	–	–	–	–	–	2,033	250,447	–	–	18.4
1992[c]	Small land mammals	–	–	–	–	–	260	35	–	–	<0.1
1992[c]	Marine mammals	–	–	–	–	–	1,080	991,528	–	–	72.7
1992[c]	Migratory birds	–	37	–	–	–	10,223	22,922	–	–	1.7
1992[c]	Upland game birds	–	–	–	–	–	1,332	933	–	–	0.1
1992[c]	Eggs	–	–	–	–	–	89	13	–	–	<0.1
1992[c]	Marine invertebrates	–	–	–	–	–	1,774	694	–	–	0.1
1992[c]	Vegetation	–	16	–	–	–	291	1,164	–	–	0.1
1995–1996	All resources	–	–	–	–	–	-	1,179,541	922	282	100.0
1995–1996	Salmon	–	–	–	–	–	288	1,326	1	<1	0.1

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1995–1996	Non-salmon fish	–	–	–	–	–	29,334	53,794	42	13	4.6
1995–1996	Large land mammals	–	–	–	–	–	2,155	293,094	229	70	24.8
1995–1996	Small land mammals	–	–	–	–	–	220	115	<1	<1	<0.1
1995–1996	Marine mammals	–	–	–	–	–	886	788,185	616	189	66.8
1995–1996	Migratory birds	–	–	–	–	–	14,725	35,032	27	8	3.0
1995–1996	Upland game birds	–	–	–	–	–	152	117	<1	<1	<0.1
1995–1996	Eggs	–	–	–	–	–	21	3	<1	<1	<0.1
1995–1996	Marine invertebrates	–	–	–	–	–	2,208	6,624	5	2	0.6
1995–1996	Vegetation	–	–	–	–	–	27	109	<1	<1	<0.1
1996–1997	All resources	–	–	–	–	–	–	957,306	837	225	100.0
1996–1997	Salmon	–	–	–	–	–	345	2,011	2	<1	0.2
1996–1997	Non-salmon fish	–	–	–	–	–	27,469	38,333	34	9	4.0
1996–1997	Large land mammals	–	–	–	–	–	1,158	157,420	138	37	16.4
1996–1997	Small land mammals	–	–	–	–	–	157	181	<1	<1	<0.1
1996–1997	Marine mammals	–	–	–	–	–	482	746,965	653	176	78.0
1996–1997	Migratory birds	–	–	–	–	–	4,472	12,210	11	3	1.3
1996–1997	Upland game birds	–	–	–	–	–	224	172	<1	<1	<0.1
1996–1997	Vegetation	–	–	–	–	–	4	14	<1	<1	<0.1
2000	All resources	–	–	–	–	–	–	1,436,020	1255	313	100.0
2000	Salmon	–	–	–	–	–	2,100	11,302	10	2	0.8
2000	Non-salmon fish	–	–	–	–	–	78,065	117,945	103	26	8.2
2000	Large land mammals	–	–	–	–	–	3,382	459,632	402	100	32.0
2000	Small land mammals	–	–	–	–	–	424	453	<1	<1	<0.1
2000	Marine mammals	–	–	–	–	–	1,491	800,582	700	175	55.8
2000	Migratory birds	–	–	–	–	–	15,645	43,949	38	10	3.1
2000	Upland game birds	–	–	–	–	–	1,071	824	1	<1	0.1
2000	Eggs	–	–	–	–	–	2	2	<1	<1	<0.1
2000	Marine invertebrates	–	–	–	–	–	36	109	<1	<1	<0.1
2000	Vegetation	–	–	–	–	–	71	240	<1	<1	<0.1
2001	All resources	–	–	–	–	–	–	1,015,248	887	228	100.0
2001	Salmon	–	–	–	–	–	332	1,949	2	<1	0.2
2001	Non-salmon fish	–	–	–	–	–	4,453	10,165	9	2	1.0
2001	Large land mammals	–	–	–	–	–	1,825	247,991	217	56	24.4
2001	Small land mammals	–	–	–	–	–	91	91	<1	<1	<0.1
2001	Marine mammals	–	–	–	–	–	777	733,448	641	165	72.2
2001	Migratory birds	–	–	–	–	–	6,390	18,815	16	4	1.9
2001	Upland game birds	–	–	–	–	–	1,029	793	1	<1	0.1
2001	Marine invertebrates	–	–	–	–	–	13	38	<1	<1	<0.1
2001	Vegetation	–	–	–	–	–	3	14	<1	<1	<0.1
2003	All resources	–	–	–	–	–	–	1,357,357	970	305	100.0
2003	Salmon	–	–	–	–	–	3,995	24,463	17	5	1.8
2003	Non-salmon fish	–	–	–	–	–	20,109	67,680	48	15	5.0

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
2003	Large land mammals	–	–	–	–	–	2,093	284,587	203	64	21.0
2003	Small land mammals	–	–	–	–	–	94	50	<1	<1	<0.1
2003	Marine mammals	–	–	–	–	–	1,551	952,837	681	214	70.2
2003	Migratory birds	–	–	–	–	–	8,119	21,261	15	5	1.6
2003	Upland game birds	–	–	–	–	–	443	343	<1	<1	<0.1
2003	Eggs	–	–	–	–	–	12	12	<1	<1	<0.1
2003	Marine invertebrates	–	–	–	–	–	1,733	5,198	4	1	0.4
2003	Vegetation	–	–	–	–	–	61	219	<1	<1	<0.1
2014	All resources	89	57	52	63	87	–	–	1,214	362	100.0
2014	Salmon	69	26	24	26	55	12,087	57,262	36	11	3.0
2014	Non-salmon fish	69	29	27	37	60	106,555	196,049	124	37	10.2
2014	Large land mammals	72	39	33	39	57	4,335	595,004	376	112	30.9
2014	Small land mammals	8	6	5	2	4	1,474	0	0	0	0.0
2014	Marine mammals	71	30	18	45	70	1,792	1,020,943	645	192	53.1
2014	Migratory birds	53	32	29	29	35	19,049	48,271	31	9	2.5
2014	Upland game birds	9	9	8	4	1	911	638	0	0	<0.1
2014	Eggs	13	7	7	3	7	3,688	1,113	1	0	0.1
2014	Marine invertebrates	7	2	2	2	5	561	1,096	1	0	0.1
2014	Vegetation	43	18	16	15	35	853	2,975	2	1	0.2

Source: 1995–1996, 1996–1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987–1989 (SRB&A and ISER 1993)
Note: "–" (No Data). "All Resources" study years are years where studies addressed all subsistence resources harvested by the community, rather than selected resources or species.
[a] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons. The estimated harvest numbers for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived by summing individual species in each resource category.
[b] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers). The total pounds for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived from conversion rates found at ADF&G (2018) and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George et al. (n.d.).
[c] Household participation for the 1992 study year is based on Table A5 in Fuller and George (1999); participation in migratory bird harvests includes waterfowl and eggs. Participation in vegetation harvests includes only berries.

Participation in subsistence activities by Utqiaġvik households is relatively high. Available data show that at least half of Utqiaġvik households successfully harvested subsistence resources during each of the study years (Table E.16.11). An even higher percentage of households used subsistence resources; in 2014, 89% of Utqiaġvik households used subsistence resources. Household participation rates were particularly high in harvests of marine mammals, migratory birds, large land mammals, and non-salmon fish (Table E.16.11). Sharing is an important tool for maintaining social networks and distributing food throughout the community. In 2014, 87% of Utqiaġvik households received subsistence resources and 63% gave subsistence resources away. The most commonly received resources included marine mammals, non-salmon fish, and large land mammals.

Table E.16.12. Utqiaġvik Subsistence Harvest Estimates by Resource Category, Single-Resource Study Years

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number	Estimated Harvest Total Pounds	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds
2005	Birds	–	–	–	–	–	10,943	–	–	–
2007	Birds	–	–	–	–	–	38,152	–	–	–
2008	Birds	–	–	–	–	–	35,250	–	–	–
2009	Birds*	–	–	–	–	–	8,664	–	–	–
2005	Eggs	–	–	–	–	–	32	–	–	–
2007	Eggs	–	–	–	–	–	1,783	–	–	–
2008	Eggs	–	–	–	–	–	204	–	–	–
2009	Eggs	–	–	–	–	–	88	–	–	–

Source: 2005, 2007, 2008, 2009 (Naves and Braem 2014)
Note: "–" (No Data). Estimated harvest number for birds includes upland game birds and migratory birds combined.

Table E.16.13. Utqiaġvik Subsistence Harvest Estimates by Selected Species, All Study Years

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1987	Caribou	–	–	26	–	–	1,595	186,669	199	62	30.1
1987	Bowhead whale	–	–	31	–	–	7	184,629	197	61	29.7
1987	Walrus	–	–	11	–	–	84	64,663	69	21	10.4
1987	Bearded seal	–	–	25	–	–	236	41,518	44	14	6.7
1987	Broad whitefish	–	–	11	–	–	10,579	27,519	29	9	4.4
1987	Moose	–	–	6	–	–	52	25,786	28	9	4.2
1987	Ringed seal	–	–	14	–	–	466	19,574	21	6	3.2
1987	White-fronted Geese	–	–	16	–	–	2,417	10,879	12	4	1.8
1987	Unknown whitefish	–	–	3	–	–	5,108	10,215	11	3	1.6
1987	Arctic grayling	–	–	14	–	–	12,664	10,131	11	3	1.6
1987	Unknown Eider	–	–	21	–	–	5,080	7,621	8	3	1.2
1987	Least cisco	–	–	–	–	–	7,024	7,024	8	2	1.1
1988	Bowhead whale	–	–	35	–	–	11	233,313	249	77	38.0
1988	Caribou	–	–	27	–	–	1,533	179,314	191	59	29.2
1988	Walrus	–	–	6	–	–	61	47,215	50	16	7.7
1988	Bearded seal	–	–	11	–	–	179	31,436	34	10	5.1
1988	Broad whitefish	–	–	11	–	–	11,432	29,423	31	10	4.8
1988	Moose	–	–	4	–	–	53	26,367	28	9	4.3
1988	Ringed seal	–	–	10	–	–	388	16,304	17	5	2.7
1988	White-fronted Geese	–	–	19	–	–	3,035	13,657	15	5	2.2

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1988	Least cisco	–	–	2	–	–	–	7,505	8	2	1.2
1988	Arctic grayling	–	–	11	–	–	8,684	6,947	7	2	1.1
1988	Unknown Eider	–	–	20	–	–	4,454	6,682	7	2	1.1%
1989	Bowhead whale	–	–	45	–	–	10	377,647	403	125	43.3
1989	Caribou	–	–	39	–	–	1,656	193,744	207	64	22.2
1989	Broad whitefish	–	–	–	–	–	30,047	78,921	84	26	9.0
1989	Walrus	–	–	13	–	–	101	77,987	83	26	8.9
1989	Moose	–	–	6	–	–	40	20,014	21	7	2.3
1989	Polar bear	–	–	4	–	–	39	19,471	21	6	2.2
1989	Bearded seal	–	–	11	–	–	109	19,152	20	6	2.2
1989	Ringed Seal	–	–	11	–	–	328	13,774	15	5	1.6
1989	White-fronted Geese	–	–	12	–	–	2,932	13,193	14	4	1.5
1989	Unknown Eider	–	–	37	–	–	8,406	12,610	13	4	1.4
1989	Humpback Whitefish	–	–	10	–	–	3,648	9,119	10	3	1.0
1992[d]	Bowhead whale	–	–	–	–	–	22	729,952	–	–	53.5
1992[d]	Caribou	–	46	–	–	–	1,993	233,206	–	–	17.1
1992[d]	Walrus	–	26	–	–	–	206	159,236	–	–	11.7
1992[d]	Bearded seal	–	–	–	–	–	463	81,471	–	–	6.0
1992[d]	Broad whitefish	–	–	–	–	–	23,997	59,993	–	–	4.4
1992[d]	Moose	–	–	–	–	–	34	17,115	–	–	1.3
1995–1996	Bowhead Whale	–	–	–	–	–	19	582,283	455	139	49.4
1995–1996	Caribou	–	–	–	–	–	2,155	293,094	229	70	24.8
1995–1996	Bearded Seal	–	–	–	–	–	431	123,352	96	30	10.5
1995–1996	Walrus	–	–	–	–	–	74	56,672	44	14	4.8
1995–1996	Unknown Eider	–	–	–	–	–	12,064	26,631	21	6	2.3
1995–1996	Ringed Seal	–	–	–	–	–	345	19,665	15	5	1.7
1995–1996	Broad Whitefish	–	–	–	–	–	5,130	16,415	13	4	1.4
1995–1996	Rainbow Smelt	–	–	–	–	–	2,164	12,983	10	3	1.1
1996–1997	Bowhead Whale	–	–	–	–	–	24	616,555	539	145	64.4
1996–1997	Caribou	–	–	–	–	–	1,158	157,420	138	37	16.4
1996–1997	Walrus	–	–	–	–	–	78	59,752	52	14	6.2
1996–1997	Bearded Seal	–	–	–	–	–	192	54,998	48	13	5.7
1996–1997	Broad Whitefish	–	–	–	–	–	6,684	21,388	19	5	2.2
1996–1997	Least Cisco	–	–	–	–	–	16,519	11,563	10	3	1.2
1996–1997	Ringed Seal	–	–	–	–	–	180	10,243	9	2	1.1
2000	Bowhead Whale	–	–	–	–	–	18	462,822	405	101	32.2
2000	Caribou	–	–	–	–	–	3,359	456,851	399	100	31.8
2000	Bearded Seal	–	–	–	–	–	729	208,380	182	45	14.5
2000	Walrus	–	–	–	–	–	115	88,781	78	19	6.2
2000	Broad Whitefish	–	–	–	–	–	21,318	68,217	60	15	4.8
2000	Ringed Seal	–	–	–	–	–	586	33,379	29	7	2.3
2000	White-fronted Geese	–	–	–	–	–	7,455	23,708	21	5	1.7
2000	Least Cisco	–	–	–	–	–	23,839	16,687	15	4	1.2
2000	Grayling	–	–	–	–	–	15,228	13,705	12	3	1.0
2001	Bowhead Whale	–	–	–	–	–	27	525,899	460	118	51.8
2001	Caribou	–	–	–	–	–	1,820	247,520	216	56	24.4
2001	Walrus	–	–	–	–	–	123	95,018	83	21	9.4
2001	Bearded Seal	–	–	–	–	–	327	93,522	82	21	9.2
2001	Ringed Seal	–	–	–	–	–	287	16,342	14	4	1.6
2001	White-fronted Geese	–	–	–	–	–	3,939	12,526	11	3	1.2
2003	Bowhead Whale	–	–	–	–	–	16	457,034	327	103	33.7
2003	Caribou	–	–	–	–	–	2,092	284,444	203	64	21.0
2003	Walrus	–	–	–	–	–	313	241,318	172	54	17.8

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
2003	Bearded Seal	–	–	–	–	–	776	221,965	159	50	16.4
2003	Capelin (grunion)	–	–	–	–	–	5,285	31,708	23	7	2.3
2003	Broad Whitefish	–	–	–	–	–	8,207	26,263	19	6	1.9
2003	Ringed Seal	–	–	–	–	–	413	23,513	17	5	1.7
2014	Caribou	70	38	33	38	52	4,323	587,897	371	111	30.6
2014	Bowhead	70	24	12	43	67	18	546,085	345	103	28.4
2014	Bearded seal	44	22	15	27	32	1,070	306,097	193	58	15.9
2014	Broad whitefish	54	22	20	29	40	43,962	140,679	89	26	7.3
2014	Walrus	31	11	4	17	27	135	103,602	65	19	5.4
2014	White-fronted Geese	39	23	22	20	22	9,595	29,745	19	6	1.5
2014	Ringed seal	19	10	8	11	11	428	24,402	15	5	1.3
2014	Beluga	15	4	0	9	14	25	24,341	15	5	1.3
2014	Chum salmon	24	13	11	10	15	4,039	24,312	15	5	1.3
2014	Sockeye salmon	29	9	9	11	23	4,630	18,667	12	4	1.0
2015	Caribou	–	44	–	–	–	3,000	351,000	–	–	–
2019	Caribou	–	–	–	–	–	3,273	–	–	–	–

Source: 1995–1996, 1996–1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 1995–1996, 1996–1997, 2000, 2001, 2003 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987, 1988, 1999 (SRB&A and ISER 1993); 2015 (SRB&A 2017b); 2019 (NSB 2020).
Note: "–" (No Data).
[a] This table shows individual species unless they are not available for a given study year. For all resources study years (1987, 1988, 1989, 1992, 1995–1996, 1996–1997, 2000, 2001, and 2003), species are listed in descending order by their percentage of the total harvest and are limited to species accounting for at least 1% of the total harvest; for single-resource study years, species are listed in descending order by the total estimated pounds (or total number harvested in the case of salmon study years) and limited to the five top species. Years lacking "percentage of total harvest" data were not comprehensive (i.e., all resources) study years.
[b] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons. The estimated harvest numbers for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived by summing individual species in each resource category.
[c] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers). The total pounds for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived from conversion rates found at ADF&G (2018), and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George et al. (n.d.).
[d] Household participation for the 1992 study year based on Table A5 in Fuller and George (1999).

1.2.2.2.1 Direct Effects Analysis Area

Utqiaġvik harvesters primarily use the direct effects analysis area to hunt for wolf, wolverine, moose, and caribou; a small number of Utqiaġvik harvesters have reported using the area for harvests of seal and goose. As shown in Table E.16.13, caribou are among the top species harvested, in terms of edible weight, by the community of Utqiaġvik. During the most recent study year (2014), over one-third (38%) of Utqiaġvik households participated in hunting caribou (the percentage would likely be higher among Native households only). Moose harvests have accounted for up to 4% of the harvest in some years; however, in recent years, these harvests have contributed less than 1% of the harvest. Similar to Nuiqsut, wolf and wolverine hunting is practiced by a smaller proportion of households; 6% of households participated in the harvest of small land mammals in 2014 (Table E.16.11; this percentage was also likely higher among Native households). However, furbearer hunting and associated income and activities are an important component of Iñupiat culture, and Utqiaġvik furbearer harvesters often expend substantial time, money, and effort in their pursuits. Data on harvest amounts specific to the direct effects analysis area are not available for Utqiaġvik.

Based on data from SRB&A (2010b), which collected subsistence use areas for key resources for the 1997–2006 time period, the direct effects analysis area is used by moose hunters (44% of harvesters), wolf and wolverine hunters (29% of harvesters), and caribou hunters (26% of harvesters) (Table E.16.14). The Colville River drainage is a primary moose hunting area on the North Slope, and some Utqiaġvik residents will travel to the Nuiqsut area by plane or boat to access this harvesting area. A small number of individuals have reported traveling to the direct effects analysis area to harvest bearded seal, ringed seal, and goose (2% of harvesters or less). For resources as a whole, approximately one-quarter (31%) of Utqiaġvik harvesters reported using the direct effects analysis area for subsistence purposes during the 1997–2006 time period (Table E.16.14).

Table E.16.14. Utqiaġvik Harvesters Using the Direct Effects Analysis Area, 1997–2006

Resource Category	Total Number of Respondents for Resource	Number of Respondents in Direct Effects Analysis Area	Percentage of Utqiaġvik Resource Respondents
Wolverine	31	9	29%
Wolf	31	9	29%
Caribou	73	19	26%
Moose	9	4	44%
Bearded seal	63	1	2%
Ringed seal	48	1	2%
Goose	71	1	1%
All resources	**75**	**23**	**31%**

Source: SRB&A 2010b

1.2.2.3 Timing of Subsistence Activities

Table E.16.15 provides data on the timing of Utqiaġvik subsistence activities based on reports from the 1980s through the 2010s. Overall, Utqiaġvik harvesters target the greatest number of resources in August and September. These months are a primary time for harvests of non-salmon fish, salmon, caribou, moose and other large land mammals, marine mammals, and plants and berries.

Table E.16.15. Utqiaġvik Annual Cycle of Subsistence Activities

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon	L	L	L	L	M	M	H	H	H	H	M	L
Marine non-salmon	L	L	L	ND	ND	L	M	H	H	M	L	ND
Salmon	ND	ND	ND	ND	L	L	H	H	M	L	ND	ND
Caribou	L	L	L	L	L	L	H	H	H	H	L	L
Moose	ND	L	L	M	M	M	M	H	H	ND	ND	ND
Bear	ND	ND	ND	L	L	L	L	M	H	L	ND	ND
Dall sheep	ND	ND	H	ND	ND	ND	ND	L	ND	ND	ND	ND
Muskox	ND	ND	H	ND	ND	ND	ND	ND	H	ND	ND	ND
Furbearers	H	H	H	M	L	L	ND	ND	L	M	H	H
Small land mammals	ND	L	L	H	H	L	M	L	M	L	L	ND
Marine mammals	L	L	L	M	M	M	H	H	H	M	M	L
Upland birds	L	L	L	M	H	M	L	L	L	L	L	L
Waterfowl	L	L	L	M	H	M	L	L	L	L	L	L
Marine invertebrates	ND	ND	ND	ND	ND	M	L	M	H	L	L	ND
Plants and berries	ND	ND	ND	ND	L	L	L	H	M	ND	ND	ND
Total number of resource categories by month	**7**	**9**	**11**	**9**	**11**	**13**	**12**	**13**	**14**	**11**	**9**	**6**

Source: (Bacon, Hepa et al. 2009; Braem, Kaleak et al. 2011; Brown, Braem et al. 2016; EDAW Inc., Adams/Russel Consulting et al. 2008; Schneider, Pedersen et al. 1980; SRB&A 2010b; SRB&A and ISER 1993; SRB&A 2017b)
Note: ND (no documented activity and/or harvests); H (high activity and/or harvests); L (limited activity and/or harvests); M (moderate activity and/or harvests).

The spring subsistence season (April and May) in Utqiaġvik is primarily dedicated to hunting bowhead whales, with some additional harvests of other marine mammals, including seals and polar bears. Hunting waterfowl such as eiders and white-fronted goose begins during these spring months (Brown, Braem et al. 2016) and, particularly for eiders, continues into the summer months. Harvests of goose peak in May and eider hunting occurs offshore during the spring whaling season (generally when leads are closed and whaling crews are not actively hunting whales).

The summer months (June–August) are a time of diversified subsistence activity when residents travel into the ocean and along various river systems in pursuit of marine, terrestrial, and riverine resources. A primary focus during the summer and fall months is hunting marine mammals (e.g., bearded and ringed seals, walruses) offshore as they migrate north with the floe ice, with eiders often a secondary target. Residents travel along the coast and inland during the summer months to hunt caribou and harvest a variety of fish in lagoons and rivers. The peak caribou hunting season is in July and August when they are available to hunters traveling by boat along the coast and on local waterways. Residents also harvest berries and other vegetation during these boating trips.

The fall bowhead whale hunt is a major focus during September and October. In addition, caribou, fish, and birds remain sought-after resources throughout fall. During August and September, some Utqiaġvik residents may travel to the Colville River to harvest moose and berries (Brown, Braem et al. 2016; Fuller and George 1999). Bacon et al. (2009) and SRB&A (2010b) also show some eider duck harvesting continuing into these fall months. The subsistence fish harvest generally peaks in October (under-ice fishery) when whitefish and Arctic grayling

are concentrated at overwintering areas. The winter months (November–March) are primarily spent hunting and trapping furbearers, in addition to harvesting caribou, ringed seals, upland birds (ptarmigan), the occasional polar bear, and fish.

1.2.2.3.1 Direct Effects Analysis Area

Utqiaġvik harvesters use the direct effects analysis area at varying levels throughout the year (Figure E.16.21). For all resources for the 1997–2006 time period, use of the direct effects analysis area is highest in February and March, with lower levels occurring throughout the rest of the year. Caribou hunting in the direct effects analysis area peaks during February and March and during July and August. Moose hunting occurs solely in August and September. Wolf and wolverine hunters use the direct effects analysis area solely during November through April, with a peak in February and March, when snow conditions allow for extensive overland travel and furs are prime. The limited seal and goose hunting reported by Utqiaġvik harvesters occurs primarily during the spring (April and May for seal; May and June for goose).

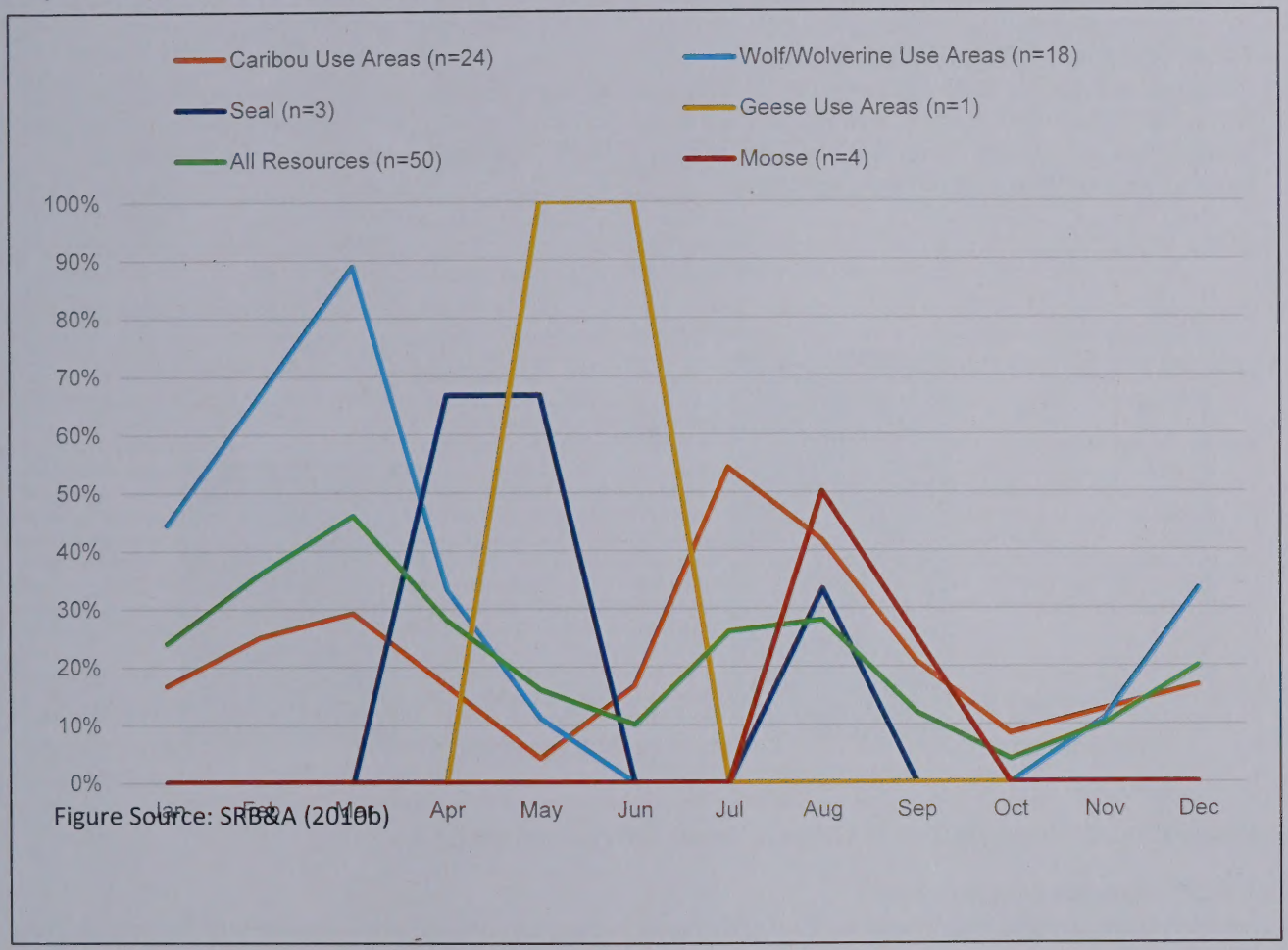

Figure Source: SRB&A (2010b)

Figure E.16.21. Utqiaġvik Subsistence Use Areas by Month in the Direct Effects Analysis Area, by Resource

1.2.2.4 Travel Methods

Table E.16.16 shows the primary travel methods used for key species, as documented in SRB&A (2010b). Boat is the primary method of travel used by Utqiaġvik residents for subsistence pursuits of certain non-salmon fish, caribou, bowhead whale, seals, walrus, and eider. Snow machine is the primary method for late fall and winter pursuits of Arctic cisco, burbot, moose, wolf, wolverine, and goose. To a lesser extent, Utqiaġvik residents also travel by foot, car/truck, ATV, and plane to access subsistence use areas.

Table E.16.16. Utqiaġvik Travel Method to Subsistence Use Areas

Resources	Boat	Snow Machine	Foot	Car/Truck	ATV	Plane
Arctic cisco and burbot	M	H	ND	L	L	M
Arctic char/Dolly Varden and broad whitefish	H	M	ND	M	M	L
Caribou	H	M	L	L	M	L
Moose	M	H	ND	ND	ND	ND
Wolf and wolverine	ND	H	ND	ND	ND	ND
Bowhead whale	H	M	ND	ND	ND	ND
Seals	H	M	ND	ND	ND	ND
Walrus	H	L	ND	ND	ND	ND
Goose	M	H	L	L	M	L
Eider	H	M	L	M	L	ND

Source: 1996–2007 (SRB&A 2010b)
Note: ND (no documented use of travel method); ATV (all-terrain vehicle); H (high use of travel method); L (limited use of travel method); M (moderate use of travel method).

1.2.2.4.1 Direct Effects Analysis Area

As shown in Figure E.16.22, for the 1997–2006 time period, snow machine was the primary method used to access the direct effects analysis area (58% of use areas), followed by boat (42%). Snow machine/overland travel generally occurs between November and April (Figure E.16.21), whereas coastal and riverine boat travel generally occurs from June through September.

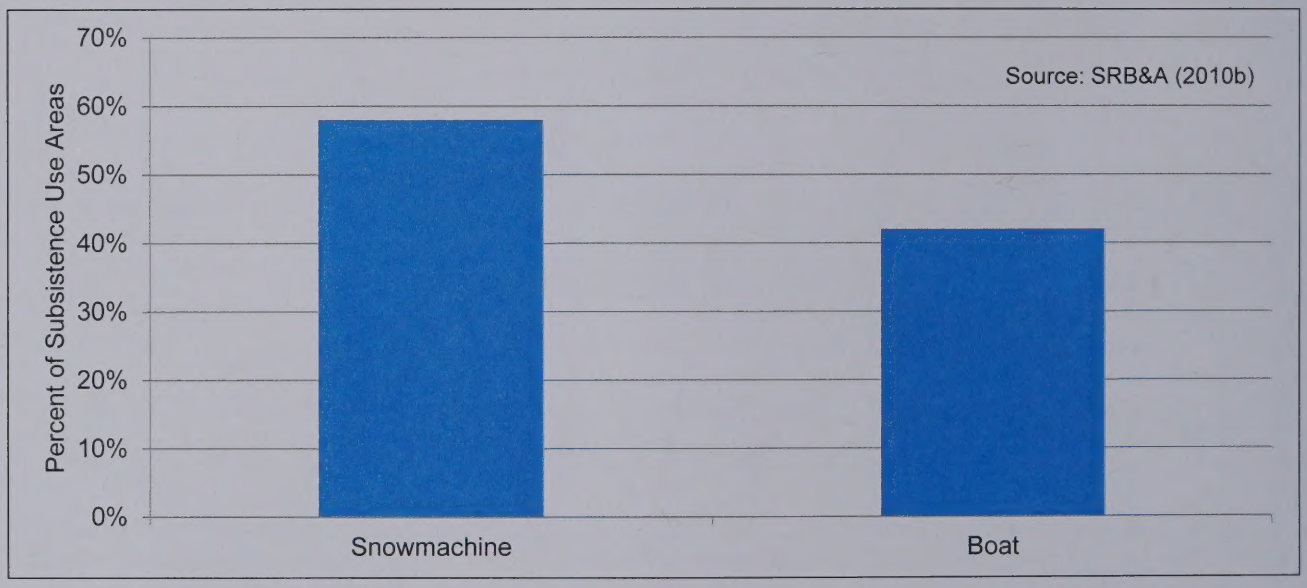

Figure E.16.22. Utqiaġvik Travel Methods, Direct Effects Analysis Area

1.2.2.5 Resource Importance

An analysis of resource importance for Utqiaġvik based on harvest (average percentage of total harvest), harvest effort (average percentage of households attempting to harvest) and sharing (average percentage of households receiving) variables is provided in Table E.16.17. Based on this analysis, resources of major importance in Utqiaġvik are bearded seal, bowhead whale, and caribou.

Table E.16.17. Relative Importance of Subsistence Resources Based on Selected Variables, Utqiaġvik

Resource Importance	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Major resources[b]	Bearded seal	22	32	9.2
Major resources[b]	Bowhead whale	24	67	42.4
Major resources[b]	Caribou	43	52	24.8
Moderate resources[c]	Walrus	19	27	8.8
Moderate resources[c]	Broad whitefish	22	40	4.1

Resource Importance	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Moderate resources[c]	Moose	2	13	2.5
Moderate resources[c]	Ringed seal	10	11	1.8
Moderate resources[c]	White-fronted goose	23	22	1.3
Moderate resources[c]	Sockeye salmon	9	23	1
Moderate resources[c]	Arctic cisco	5	33	<1
Moderate resources[c]	Arctic grayling	13	17	<1
Moderate resources[c]	Beluga	4	14	<1
Moderate resources[c]	Blueberry	4	14	<1
Moderate resources[c]	Chinook/king salmon	5	12	<1
Moderate resources[c]	Chum/dog salmon	13	15	<1
Moderate resources[c]	Coho/silver salmon	9	20	<1
Moderate resources[c]	King eider	16	14	<1
Moderate resources[c]	Pink/humpback salmon	9	12	<1
Moderate resources[c]	Rainbow smelt	2	18	<1
Moderate resources[c]	Salmonberry/Cloudberry	12	30	<1
Minor resources[d]	Common eider	9	9	<1
Minor resources[d]	Halibut	3	8	<1
Minor resources[d]	Humpback whitefish	7	5	<1
Minor resources[d]	Least cisco	6	7	<1
Minor resources[d]	Polar bear	2	6	<1
Minor resources[d]	Ptarmigan	9	1	<1
Minor resources[d]	Sheefish	–	6	–
Minor resources[d]	Snow goose	5	2	<1
Minor resources[d]	Wolf	<5	<5	<1
Minor resources[d]	Wolverine	<5	<5	<1

Source: 1995 to 1996, 1996 to 1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987 to 1989 (SRB&A and ISER 1993); 2015 (SRB&A 2017b); 2019 (NSB 2020)

Note: "–" (resource was not harvested or no households attempted to harvest the resource).

[a] For space considerations, resources that contributed an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% receiving resources are categorized as minor and are not shown.

[b] Major resources contribute >9% of the total harvest, have ≥50% of households attempting to harvest, or have ≥50% of households receiving resources.

[c] Moderate resources contribute 2% to 9% of the total harvest, have 11% to 49% of households attempting to harvest, or have 11% to 49% of households receiving resources.

[d] Minor resources contribute <2% of the total harvest, have ≤10% of households attempting to harvest, or have ≤10% of households receiving resources. For space considerations, resources contributing an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% receiving resources are categorized as minor and are not shown. While wolf and wolverine fall below the threshold for inclusion (less than 1% of material importance and less than 5% of cultural importance), they are included because of their relevance to the analysis area.

2.0 COMPARISON OF ACTION ALTERNATIVES AND OPTIONS

Tables E.16.18 and E.16.19 summarize and compare impacts to subsistence use areas among the action alternatives and module delivery options.

Table E.16.18. Comparison of Impacts to Subsistence Uses for Nuiqsut*

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three-Pad Alternative (Fourth Pad Deferred)	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Resources (importance)	Caribou (major) Furbearers (minor)[a] Waterfowl (major) Fish (major)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou (major) Furbearers (minor)[a] Waterfowl (major) Seals (major)	Caribou (major) Furbearers (minor)[a] Waterfowl (major)	Caribou (major) Furbearers (minor) Waterfowl (major)
Resource abundance	No impacts to overall abundance expected	Same as Alternative B	Same as Alternative B	Same as Alternative B	No impacts to overall abundance expected	Same as Option 1	Same as Option 1
Resource availability	Caribou: Greatest potential for impacts to resource availability Furbearers: High likelihood of reduced furbearer availability near the Project Waterfowl, fish: Low likelihood as Project does not overlap with areas of high overlapping subsistence use and large-scale contamination events are unlikely	Caribou: Impacts to caribou resource availability reduced from Alternative B. Increase in air traffic impacts would be offset by decreased infrastructure and potential for deflection. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Least potential for impacts to resource availability. Increase in air traffic impacts would be offset by decreased infrastructure and potential for deflection. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Impacts to caribou resource availability reduced from Alternative B due to the reduction in length of road and other infrastructure. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: High likelihood of reduced availability near ice roads Waterfowl: Moderate likelihood of reduced availability during one spring hunting season Seals: Moderate likelihood of reduced availability to individual hunters during multiple summers	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: High likelihood of reduced furbearer availability near ice roads Waterfowl: Moderate likelihood of reduced waterfowl during one spring hunting season	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: Moderate likelihood of reduced furbearer availability near ice roads during two hunting seasons Waterfowl: Low likelihood of reduced availability during two spring hunting seasons

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three-Pad Alternative (Fourth Pad Deferred)	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Harvester access	High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels Moderate likelihood of impacts during operation due to physical obstructions and safety considerations while hunting along roads Moderate likelihood of increased access although the use of roads may decrease with distance from the community	Same as Alternative B	High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels Lower likelihood of impacts to access during operation due to fewer physical obstructions to access. Impacts related to safety considerations would remain Low likelihood of increased access although the use of roads may decrease with distance from the community	Same as Alternative B	Caribou, furbearers, waterfowl: High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul and module transport ice roads near the community and barriers to overland travel due to high traffic levels Seals: Low to moderate likelihood of impacts as the module transfer island is on the periphery of the hunting area General: Low likelihood of changes to access in nearshore/coastal areas due to erosion/sedimentation	Caribou, furbearers, waterfowl: High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels	Caribou, furbearers: Moderate likelihood of impacts during the construction phase due to the periodic lack of ice road access on module transport ice roads in high-use winter hunting areas and potential barriers to overland travel
Community-level impacts	Impacts are most likely to occur for Nuiqsut Harvesters (up to 91% directly affected)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Impacts are most likely to occur for Nuiqsut Harvesters (up to 94% directly affected)	Impacts are most likely to occur for Nuiqsut Harvesters (up to 94% directly affected)	Impacts are most likely to occur for Nuiqsut Harvesters (up to 91% directly affected)

[a] Despite being characterized as a resource of minor importance based on selected measures, furbearer hunting and trapping is a specialized activity with unique importance to Nuiqsut and Utqiaġvik.

Table E.16.19. Comparison of Impacts to Subsistence Uses for Utqiaġvik*

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three -Pad Alternative	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Resources (importance)	Caribou (major) Furbearers (minor)[a]	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou (major) Furbearers (minor)[a]	Same as Option 1	Same as Option 1
Resource abundance	No impacts to overall abundance expected	Same as Alternative B	Same as Alternative B	Same as Alternative B	No impacts to overall abundance expected	Same as Option 1	Same as Option 1
Resource availability	Caribou: Low potential for impacts to resource availability Furbearers: Low to moderate likelihood of reduced availability as the Project does not overlap with areas of high overlapping subsistence use but occurs to the east of moderate overlapping use	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou: Low potential for impacts to resource availability Furbearers: Low to moderate likelihood of reduced availability as the Project does not overlap with areas of high overlapping subsistence use but occurs to the east of moderate overlapping use	Furbearers and caribou: Low to moderate likelihood of reduced availability as high-volume ice roads would occur directly to the east of high overlapping use to the south of Teshekpuk Lake	Caribou and furbearers: Low potential for impacts to resource availability due to the location of the ice road in the periphery of community use areas
Harvester access	Low likelihood of reduced access as the Project does not overlap with areas of high overlapping subsistence use Low likelihood of increased access	Same as Alternative B	Same as Alternative B	Same as Alternative B	Low likelihood of reduced access as the Project does not overlap with areas of high overlapping subsistence use	Same as Option 1	Same as Option 1
Community-level impacts	Impacts may occur for Utqiaġvik but are less likely (up to 12% directly affected)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Impacts may occur for Utqiaġvik but are less likely (up to 11% directly affected)	Impacts are more likely to occur for Utqiaġvik harvesters under Option 2 (up to 23% of harvesters) compared to Option 1 (up to 11% of harvesters). In addition, the Point Lonely option is more likely to cause indirect impacts to Utqiaġvik harvesters than Option 1 because of its proximity to key Utqiaġvik harvesting areas at Teshekpuk Lake	Impacts could affect a higher percentage of Utqiaġvik harvesters under Option 3 (15% of harvesters) compared to Option 1 (11% of harvesters) but would be less likely because of the greater distance of the ice road infrastructure from the community

[a] Despite being characterized as a resource of minor importance based on selected measures, furbearer hunting and trapping is a specialized activity with unique importance to Nuiqsut and Utqiaġvik.

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Appendix E.17
Environmental Justice Technical Appendix

There is no technical appendix for this resource

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Appendix E.18
Public Health Technical Appendix

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List of Acronyms

BLM	Bureau of Land Management
DHSS	Alaska Department of Health and Social Services
HEC	health effects category
NSB	North Slope Borough

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1.0 PUBLIC HEALTH

Table E.18.1 describes the health effects categories (HECs) and Table E.18.2 provides an overview of the technical guidance for evaluating health impacts from resource development used to inform the health impact analysis. Guidance for evaluation comes from:

- Alaska Department of Health and Social Services (DHSS), *Alaska Health Impact Analysis Technical Guidance* (2015)
- North Slope Borough (NSB), *Health Impact Assessment for Natural Resource Development in Alaska Collaborative Guidance* (2015)
- Bureau of Land Management (BLM), *National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement* (2020) health effects analysis

Table E.18.1. Health Effects Category Descriptions

Health Effects Category	Description
HEC1: Social determinants of health	Economic status, educational status, social support systems, employment status, mental health, maternal and child health, substance use, social exclusion, psychosocial distress, historical trauma, and family dynamics
HEC2: Accidents and injuries	Intentional and unintentional injuries with fatal and nonfatal results; traffic patterns, alcohol involvement, emergency services availability, presence of law enforcement, and presence of prevention programs
HEC3: Exposure to potentially hazardous materials	Documented illnesses or exacerbation of illnesses commonly associated with pollutants through inhalation, ingestion, or physical contact
HEC4: Food, nutrition, and subsistence activities	Nutrient levels, malnutrition, or improvements in nutrient intake, diet composition, food security, and consumption of subsistence foods
HEC5: Infectious disease	Rates of increase or decrease for a range of infectious diseases, such as sexually transmitted infections, respiratory illness, or skin infections; immunization rates; and the presence of infectious disease prevention efforts
HEC6: Water and sanitation	Changes to access, quantity, and quality of water supplies; distance to clean water, water fluoridation, indoor plumbing, water treatment facilities, and existence of community facilities, such as washaterias or community showers
HEC7: Non-communicable and chronic diseases	Increases/decreases in mortality and morbidity rates of cancer, cardiovascular and cerebrovascular diseases, diabetes, respiratory diseases, and mental health disorders; smoking rates, rates of alcohol and drug abuse, physical activity levels, presence of recreation centers, and cancer-screening rates
HEC8: Health services infrastructure and capacity	Increase or decrease in the number of medical evacuations, clinic or hospital visit trends, health expenditures, and medication usage; distance to health facilities, medevac facilities/aircraft, the presence of community health aides, and the frequency of physician visits to the area

Source: DHSS 2015
Note: HEC (health effects category)

Table E.18.2. Health Effect Factors from Relevant Guidance Documents*

Alaska HIA Technical Guidance (ADHSS 2015)	HIA for Natural Resource Development in Alaska Collaborative Guidance (NSB 2015)	National Petroleum Reserve in Alaska IAP/EIS Health Effects Analysis (BLM 2020)	"Public Health Information for the Willow Master Development Plan." (EXP Energy Services Inc. 2022)
HEC1: Social determinants of health	Overall health and well-being Psychological and gender issues Maternal and child health	Acculturative stress Economic impacts on health	Employment, Economic status, Household income, Poverty levels Social connections and cultural continuity Mental health
HEC2: Accidents and injuries	Accidents and injuries	Safety	Accidents and injuries
HEC3: Exposure to potentially hazardous materials	Contaminant exposure	Environmental exposures	Air quality and air pollutant emissions Water Quality
HEC4: Food, nutrition, and subsistence activities	Food, nutrition, and physical activity	Diet and nutrition	Food and nutrition Subsistence activities
HEC5: Infectious disease	Infectious disease	Infectious disease	Communicable diseases Infectious diseases Immunizations
HEC6: Water and sanitation	Water and sanitation	NA	Water and sanitation
HEC7: Non-communicable and chronic diseases	Non-communicable/chronic diseases	NA	Non-communicable/chronic diseases
HEC8: Health services infrastructure and capacity	Health services infrastructure and capacity Occupational/community health interface	Health-care services	Health-care services

Note: HEC (health effects category); HIA (Health Impact Assessment); IAP/EIS (Integrated Activity Plan/Environmental Impact Statement); NA (not applicable)

2.0 REFERENCES

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Appendix E.19
Wilderness Characteristics Technical Appendix

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Appendix E.20
Cumulative Effects Technical Appendix

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Appendix F
Cultural Resources Findings: Process and Analysis

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List of Acronyms

AHRS	Alaska Heritage Resources Survey
BLM	Bureau of Land Management
BMP	best management practice
DEW	Distant Early Warning
EIS	Environmental Impact Statement
IAP	Integrated Activity Plan
LS	lease stipulation
MDP	Master Development Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHA	Office of History and Archaeology
Project	Willow Master Development Plan Project
RFFAs	reasonably foreseeable future actions
ROD	Record of Decision
ROP	required operating procedure
TLUI	Traditional Land Use Inventory

Note to Readers

To assist readers in identifying new information in this Supplemental EIS, new or substantially revised text is highlighted in light yellow (as shown in this paragraph). Substantial revisions include changes to the text or underlying data that have changed the analysis or analysis conclusion. All sections that are new or include significant or substantial revisions include an asterisk ("*") at the end of the section header; all new or substantially revised tables and figures also include an asterisk at the end of the table or figure caption.

1.0 CULTURAL RESOURCES FINDINGS: PROCESS AND ANALYSIS*

The cultural history of northern Alaska is described in detail in Bureau of Land Management's (BLM's) National Petroleum Reserve in Alaska (NPR-A) Final Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) (BLM 2020b). Cultural resources found on the North Slope broadly represent a long prehistory of land use, followed by more recent historic land use by Iñupiat and influences from Euro-Americans beginning in the nineteenth century. Cultural resources on the North Slope can represent a broad variety of types, ranging from distinctly human-made objects and changes to the landscape, to places with less definitive expressions of use by people in the past, albeit with great significance to North Slope communities. Such resources include but are not limited to the following:

- Prehistoric and historic archaeological sites, features, and artifacts, such as those associated with camps and villages, buildings and structures, dwellings (e.g., sod houses, semi-subterranean houses, and tent rings), production and use of objects (e.g., discarded tools and tool-making debris), subsistence activities (e.g., discarded animal bone accumulations, reindeer herding fences, ice cellars, and caches), and transportation (e.g., boat and sled remains).
- Places significant to Iñupiat heritage and traditional land use (e.g., burial places and hunting, fishing, and trapping and camping areas).
- Cultural landscapes and areas important for reasons of cultural identity or religious significance.
- For purposes of the Willow Master Development Plan Project (Project) Supplemental Environmental Impact Statement (EIS), paleontological resources are also considered.

A variety of federal, state, and local regulations govern how cultural resources are described and analyzed. Although compliance requirements for these regulations are similar, the types of cultural resources considered, as well as the implementation of cultural resources review, differ. The National Environmental Protection Act (NEPA) requires disclosure and consideration of impacts to the human environment, of which cultural resources are considered a subcategory (40 CFR 1508.14). Section 106 of the National Historic Preservation Act (NHPA) (54 USC 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties (prehistoric or historic districts, sites, buildings, structures, or objects listed in or eligible for the National Register of Historic Places). Both NEPA and Section 106 of the NHPA require consultation with agencies and key stakeholders (including tribal and municipal governments and members of the public) and afford a reasonable opportunity for consulting parties to comment on the potential for impacts to cultural resources or to alert the lead agency to the presence of potentially impacted cultural resources. BLM conducted the NHPA Section 106 review concurrently with NEPA. Other regulatory statutes that protect cultural resources include the Antiquities Act (16 USC 431–433), the Historic Sites Act (16 USC 461–467), the Archaeological and Historic Preservation Act (16 USC 469–469c), the American Indian Religious Freedom Act (42 USC 1996), the Archaeological Resources Protection Act (16 USC 470aa–470ll), the Abandoned Shipwreck Act (43 USC 2101–2106), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.), EO 13007: Indian Sacred Sites, and the Alaska Historic Preservation Act (AS 41.35). The Project would also require a Certificate of Traditional Land Use Inventory (TLUI) Clearance from the North Slope Borough (NSB), certifying that no TLUI sites would be negatively impacted.

1.1 Supplemental Analysis*

Initial analysis of potential Project impacts was completed as part of the Final EIS for the Willow Master Development Plan (MDP), which concluded with BLM receiving concurrence from the SHPO of a finding of No Adverse Effect to historic properties in September 2020. Additional analysis has been conducted for this Supplemental Environmental Impact Statement, developed in response to the 2021 Alaska District Court decision requiring BLM to address NEPA deficiencies found by the court.[1]

The Office of History and Archaeology's (OHA's) Alaska Heritage Resources Survey (OHA 2022), which contains an inventory of all documented archaeological sites in the state of Alaska, is the primary source of information for archaeological resources in the Project area. A subset of the NSB's TLUI within the Project

[1] Refer to the August 18, 2021, Alaska District Court decision (*Sovereign Iñupiat for a Living Arctic et al. v. BLM* [Case No. 3:20-cv-00290-SLG] and *Center for Biological Diversity et al. v. BLM* [3:20-cv-00308-SLG], United States District Court, D. Alaska) remanding the Willow MDP to BLM for the purpose of addressing NEPA deficiencies found by the Court.

vicinity was acquired from the NSB Department of Iñupiat History, Language and Culture (NSB 2019, 2020); the TLUI is the primary source of information regarding Iñupiat traditional use areas, although BLM pursued additional information through consultation with local and regional tribal and municipal governments and Alaska Native corporations, and the public. Academic literature, agency documents, and cultural resources survey reports from other studies conducted within the Project area provided more robust information about sites documented in the area. Recent cultural resource surveys conducted in support of the Project (Reanier 2017, 2018, 2019b, 2019c, 2020, 2022a, 2022b, 2022c) provided the most current archaeological site location and condition information for the area; however, this analysis reviewed documentation for all known archaeological surveys that overlapped the APE.

1.2 Consultation Efforts*

In accordance with 36 CFR 800.2(c), BLM consulted with the SHPO and other potential consulting parties under NHPA Section 106 for both the Willow MDP EIS and SEIS. Throughout both the Willow MDP EIS and SEIS processes, BLM sought NHPA Section 106 consultation with North Slope regional and local Tribal, municipal, and corporation entities, non-governmental organizations. BLM invited these parties to consult under Section 106 during in-person and/or remote Government-to-Government, NPR-A working group, and public scoping meetings, and using email and certified letters. In accordance with 36 CFR 800.2(d)(3), BLM afforded opportunity for public involvement in the Section 106 process via BLM's online National NEPA Register and throughout the NEPA process.

The State of Alaska, NSB, NVN, City of Nuiqsut, and ICAS are cooperating agencies on the SEIS. As such, these entities had increased authority, responsibility, and involvement in the environmental review process, and additional opportunity to leverage concerns about the Project and effects to cultural resources and historic properties.

To date, no North Slope Tribal, municipal, or corporation representatives, North Slope community members, or non-governmental organizations have elected to consult with BLM regarding places of historic or cultural importance regarding the Willow MDP EIS or SEIS. BLM's consultation efforts did not result in any responses indicating specific or general concerns for documented (i.e., listed in the AHRS or TLUI) or undocumented places of historic or cultural importance or traditional use in the Project areas. BLM did not receive any public comments pertaining to cultural or paleontological resources regarding the Willow MDP SEIS.

1.3 Potential Impacts

Direct impacts are those that are caused by, and occur during, the Project (36 CFR 800.5; 40 CFR 1508.8) and are primarily limited to the Project footprint. Ground-disturbing activities (e.g., drilling, gravel mining, construction and use of grounded ice bridge, etc.) pose the greatest threat of direct impacts to cultural resources, especially archaeological sites, by destabilizing, damaging, or destroying subsurface and aboveground cultural and paleontological resources and contexts. Support activities (including the transport and staging of materials, heavy equipment, and personnel) and manufacture and use of the grounded ice roads and pads could also directly affect surficial and shallowly buried cultural resources through inadvertent ground disturbance, vibration, and compaction.

Indirect impacts are those that occur beyond the Project footprint or after the Project's completion and are reasonably foreseeable. The greatest immediate threats to cultural resources outside the project footprint (i.e., direct effects per NHPA Section 106 or indirect effects per NEPA) involve altering visual, audible, atmospheric, or olfactory qualities in a historic property's surroundings.

Cumulative impacts include those resulting from past, present, and reasonably foreseeable future actions (RFFAs) or effects relating to the Project and can extend beyond the 2.5-mile indirect effects analysis area. Regarding cultural and paleontological resources, the most significant cumulative effects (i.e., indirect effects per NHPA) involve the Project's influence on expanding into future development projects, its contributions to climate change—particularly with degrading permafrost, and increasing erosion, and improving access to otherwise remote and difficult-to-access locations, followed by increased foot or vehicle traffic and subsequent (even unintentional) erosion, vandalism, and/or looting in sensitive areas.

1.4 Previously Identified Cultural Resources and Surveys*

The Alaska Heritage Resources Survey (AHRS) (OHA 2022) lists 93 sites (78 cultural and 15 paleontological) documented within or overlapping the APE, all but 15 of which, discussed further below, fall outside the Project footprint. Of the 78 cultural sites, 23 were determined eligible for NRHP inclusion, eight were determined not eligible, and 47 have not been evaluated for NRHP listing eligibility (Table F.1.1).

1.4.1 Previous Surveys*

The Proponent began conducting surveys to identify cultural resources specifically for the Willow MDP in 2017, which continued through the summer of 2022 and included areas both with and without reported records of previous cultural surveys (Reanier 2018, 2019b, 2019c, 2020, 2022a, 2022b, 2022c). These Willow MDP-specific surveys focused on areas within and surrounding the Project footprints, extending throughout 100% of the proposed permanent infrastructure footprints (including gravel mine locations) under all four development alternatives (Reanier 2018, 2019b, 2019c, 2020, 2022a, 2022b, 2022c), and 90% of the proposed temporary ice road alignments. To date, the Proponent surveyed all proposed ice road alignments falling within the NPR-A boundary, including routes for Module Delivery Options (Reanier 2019c, 2020), the route segment between Ocean Point and just west of GMT2 (Reanier 2019c, 2020), and other ice roads that would be associated with the Project construction phase (Reanier 2017, 2018, 2019b, 2019c, 2020).

In addition, the cultural resources analysis area has been examined repeatedly for cultural resources due to nearby oil and gas development projects and academic studies since 1977 (Hall Jr. 1977, 1978, 1979, 1982; Hemmeter, Teese et al. 2019; Lobdell 1981, 1982, 1985, 1986, 1988, 1991, 1993, 1996, 1998a, 1998b, 1999; Lobdell and Lobdell 1999; Mobley & Associates 2016; Reanier 2003, 2004, 2008, 2013, 2014, 2017, 2018, 2019a, 2019b, 2019c, 2020, 2022a, 2022c; SRB&A 2018).[2] Collectively, the Proponent's and others' surveys have covered 100% of the direct Project footprint, including proposed ice road alignments. Figure F.1.1 depicts aerial and/or ground surveys conducted within the analysis area.

1.4.2 Cultural Resource Sites*

Of the 93 AHRS sites in the APE, 25 sites (22 cultural and three paleontological) have either been destroyed (through excavation, removal, or erosion), duplicated in the AHRS, or could not be located. This includes six sites determined eligible, and eight sites determined not eligible, for listing on the NRHP. The U.S. Air Force removed 12 buildings from Point Lonely during environmental remediation activities at the POW-1 Distant Early Warning (DEW) Line Station (K. Leeper, Archaeologist, personal communication to L. O'Quinn [DOWL], March 18, 2019; report pending to OHA). Agency and contract archaeologists removed four sites through data recovery and/or mitigation excavations and confirmed that erosion destroyed the other six. Agency and contract archaeologists made multiple, unsuccessful attempts to locate two other sites in the APE, indicating that these sites also likely either eroded or have incorrect coordinates. One site was originally identified using only a location from the original 1976 TLUI, and despite being positively identified later in another location and assigned a new AHRS number, the original site card remains listed in the AHRS (Table F.1.1).

Of the remaining 68 AHRS sites, eight are prehistoric, 28 are historic or modern Iñupiaq, 19 are historic or modern Euroamerican, one is a multicomponent site with evidence of historic Iñupiaq and Euroamerican and prehistoric use, and 12 are paleontological. Of these 68 intact sites in the APE, 17 have been determined eligible for listing on the NRHP and the rest remain unevaluated.

The NSB TLUI lists 45 traditional land use sites documented within or overlapping the analysis area, 10 of which correspond with AHRS-documented sites (NSB 2019, 2020). Two of these 10 have been determined eligible for NRHP listing, and the remainder are unevaluated. Four of the eight unevaluated TLUI sites are either destroyed or could not be located. Of the 35 TLUI sites without a corresponding AHRS number, 10 have been destroyed, could not be relocated during recent surveys, or have erroneous location information. Thirteen of the AHRS and/or TLUI sites reportedly contain graves, all of which fall outside the Project footprint and distant from permanent infrastructure. Two of these sites are confirmed, or presumed, to be gone due to erosion, while three sites listed in the TLUI either could not be located or safely accessed (Table F.1.1).

[2] This list is not exhaustive.

Most sites identified in the APE (61 cultural of 73 total,) fall within 2.5 miles of temporary ice infrastructure. As shown in Table F.1.2, new permanent infrastructure associated with the proposed Project (i.e., new gravel and pipeline infrastructure and the proposed mine) in the Willow Area are distant from most documented sites. However, new pipeline between the GMT2 and Kuparuk CPF2 pads and routing for the Module Delivery Options would pass near to, or over, several documented AHRS and TLUI sites. There are seven AHRS and four TLUI sites within one mile of permanent or long-term temporary infrastructure, and 18 AHRS and 10 TLUI sites located within one mile of temporary ice infrastructure. The AHRS sites nearest to any Project components occur near Module Delivery Option 2 and the proposed new pipeline between the GMT2 and Kuparuk CPF2 (Table F.1.2).

Module Delivery Option 2 would use the existing gravel infrastructure at Point Lonely to stage modules prior to transport via ice road to the Project area (note: the gravel infrastructure and TES-00120 are all that remain at Point Lonely). The Point Lonely gravel infrastructure consists of three intact, or largely intact, sites (TES-00043, TES-00044, and TES-00045) all of which were determined eligible for NRHP listing prior to remediation activities at the site. Staging and transport of the Project modules is unlikely to disturb these gravel pads, as the gravel infrastructure was constructed to support heavy loads associated with the POW-1 DEW Line Station (e.g., buildings, vehicles, equipment, etc.), which was later used to support oil exploration operations beginning in the 1970s. Additionally, the site with two graves (TES-00120) at Point Lonely is located on a tundra patch outside the existing gravel infrastructure but within the larger TES-00048 boundary.

Under All Action Alternatives, CPAI would construct new pipeline and VSMs along the existing pipeline between the GMT2 and Kuparuk CPF2 pads. Like the existing pipeline, new pipeline and VSMs pads would bisect HAR-000173 (the Colville #1 Peat Road), which is a raised, 12-15-foot-wide, historic road that extends over approximately 46 miles between the Colville River Delta and 14 miles east of Ocean Point. In 2017, the SHPO and US Army Corps of Engineers determined HAR-000173 eligible for listing on the NRHP under Criteria A and C for its role in the development of the oil and gas industry in Alaska and its unique type and method of construction.

The new pipeline would also pass within 750 feet of HAR-00156/TLUIHAR082 and TLUIHAR059. CPAI would align new VSMs to existing VSMs to the extent practicable and generally within 330 feet of the existing pipeline; however, some deviation may be necessary beyond this due to ground conditions and engineering needs; however, CPAI would continue to route the pipeline away from HAR-00156/TLUIHAR082 by a minimum of 500 feet. The new pipeline, positioned roughly parallel and near to the existing pipeline in this area, is unlikely to impact physical features or traditional land use activities associated with these sites any differently than the current pipeline.

1.5 Findings*

The Project would not likely result in direct or indirect impacts to historic properties or paleontological resources. BLM permit requirements ensure that a cultural resources survey would be undertaken, and cultural resources avoided; NSB requires TLUI clearance before issuance of permits; and the Proponent's voluntary avoidance measures and operating procedures (provided in Appendix I.1, *Avoidance, Minimization, and Mitigation*) are also intended to protect cultural resources. The coverage and results of Project surveys and previous surveys indicate that previously undocumented cultural resources are unlikely to exist in the analysis area (Figure F.1.1).

Table F.1.3 summarizes the applicable NPR-A IAP lease stipulations (LSs) and required operating procedures (ROPs) that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to cultural resources from development activity (BLM 2022). The LSs and ROPs would reduce impacts to cultural resources associated with the construction, drilling, and operation of oil and gas facilities. In 2021, BLM was directed to reevaluate the 2020 NPR-A IAP (BLM 2020a). The NPR-A IAP reevaluation resulted in the issuance of a new NPR-A IAP ROD (BLM 2022). Full text of the requirements is provided in BLM (2022).

All action alternatives would require deviations from existing LS K-1 because they would include road and pipeline crossings of one or more of the waterbodies protected in the LS. These deviations would not result in adverse impacts to cultural resources.

Areas of traditional subsistence land use are a critical cultural element in the Project area and are addressed in Section 3.16, *Subsistence and Sociocultural Systems*, of this Supplemental EIS. TLUI clearance is required by NSB to ensure avoidance of sensitive Alaska Native cultural sites before issuing a Development Permit or Administrative Approval, and the Proponent must seek TLUI clearance before receiving a permit from NSB. Potentially undocumented places that are significant to North Slope heritage but lack definitive expressions of land use are best identified and assessed through consultation with local and regional tribal and municipal governments and Alaska Native corporations, as well as other community members. BLM's efforts thus far to consult with these entities within Nuiqsut and the NSB under NEPA and Section 106 have not resulted in expressed concerns for impacts to specific cultural resources within the Project area.

1.5.1 Direct Impacts*

Two cultural resources (HAR-00173 and TES-00043) have been identified within the Project footprint. Project components (temporary and/or permanent) would overlap these identified historic properties but would do so in ways that avoid degrading aspects of integrity related to physical form (e.g., location, materials, design, and workmanship) or surroundings (e.g., setting, feeling, or association) that contribute to their significance, while maintaining an association between modern and historic functions at these places. Therefore, direct impacts to cultural resources would be unlikely to occur.

Under All Action Alternatives, CPAI would construct new pipeline and VSMs along the existing pipeline between the GMT2 and Kuparuk CPF2 pads. Like the existing pipeline, new pipeline and VSMs pads would bisect HAR-000173 (the Colville #1 Peat Road). CPAI would cross the pipeline over the historic property, suspending it several meters above the road with VSMs (which are spaced 55 feet apart on average) placed as far away from the structure as possible. In so doing, CPAI would avoid direct physical impacts to the peat road. Although the existing and new pipeline would cross HAR-00173, the overall character-defining features (raised height and peat as a construction material) would remain intact and evident. During consultation conducted for the Nanushuk Project in 2017 and 2018, SHPO concurred that, although a road or pipeline bisecting the HAR-00173 would likely disturb those locations, the resulting impacts would be minor compared to the overall length of the feature (Oil Search 2018). Similarly, given that that an existing pipeline currently passes over HAR-000173, and that the new pipeline would similarly pass over a short (<10 meter) length of the 46-mile-long road within approximately 100 meters of the existing pipeline, the proposed additional pipeline would not cause adverse impacts to HAR-00173. Moreover, HAR-00173 has a historic association with oil development in Arctic Alaska, and the modern oil pipelines that either already or would potentially pass over it are consistent with the property's historic function for supporting oil and gas development.

Module Delivery Option 2 would use the existing gravel infrastructure (TES-00043) at Point Lonely to stage modules prior to transport via ice road to the Project area. CPAI would stage the modules in winter and would not modify the Point Lonely gravel infrastructure, and then transport the modules in winter, primarily relying on land-based ice road. The gravel pads' proposed use to stage and transport heavy equipment is consistent with its historical function, especially when considering POW-1's role in supporting oil and gas exploration in the NPR-A in the 1970s. While ice roads and pads in the NPR-A generally result in temporary, observable changes to the tundra due to the scuffing, crushing, or compression of the underlying tussocks, the visibility and type of changes due to ice compaction vary depending on local water saturation, which also influences recovery time (Guyer and Keating 2005; Pullman, Jorgenson et al. 2005; Yokel, Huebner et al. 2007).

1.5.2 Indirect Impacts*

Indirect impacts to cultural resources would also be unlikely. With the exception of HAR-00173 and TES-00043, the Proponent would opt to route all Project components at least 500 feet from all other recorded cultural sites and would avoid the Prince Creek Formation when constructing the ice road crossing of the Colville River near Ocean Point. To ensure appropriate treatment of inadvertent discoveries, the Proponent would maintain a Fossil and Artifact Finds Standard Operating Procedure.

Of the 37 intact cultural sites located outside of the Project footprint but within 2.5 miles of permanent Willow Project, six AHRS and four TLUI sites are within one mile of permanent or long-term temporary infrastructure (HAR-00156/TLUIHAR82, TES-00044, TES-00045, TES-00120, XBP-00039, XBP-00058, TLUIHAR059, TLUIHAR103, and TLUITES218). While it is possible that the proposed permanent Project infrastructure may

result in some perceptible visual, audible, or olfactory change within any of these ten sites' settings for the life of the Project, such changes are unlikely to result in adverse impacts to the sites' physical form or surroundings.

Sites located near the proposed pipeline (HAR-00156/TLUIHAR82, TLUIHAR059, TLUIHAR103) would be avoided by a minimum of 500 feet. Careful placement of the pipeline and VSMs roughly parallel to those of the existing pipeline will avoid impacts to traditional land use activities associated with TLUIHAR059. Use of existing gravel infrastructure sites (TES-00044 and TES-00045) to stage and transport heavy equipment for Module Delivery Option 2 is consistent with these sites' historical function. Two graves (TES-00120) located amidst the former DEW Line site are nearly one mile away from Project components associated with Module Delivery Option 2. No archaeological remnants could be located at TLUITES218, which is nearly one-half mile away from proposed temporary Project infrastructure. Likewise, staging and transport of heavy equipment is unlikely to impact any potential traditional land use activities that may be associated with this site. Road widening required for Module Delivery Option 3 would occur near gravel infrastructure of the DEW Line Station boundary (XBP-00039) and Oliktok LRRS Road System (XBP-00058). These sites remain in use to support oil and gas operations at Oliktok; Project infrastructure is therefore unlikely to impact these sites.

There are 17 AHRS and 10 TLUI sites located within one mile of temporary ice infrastructure (Table F.1.2). Regarding temporary ice infrastructure, CPAI would temporarily rely on ice roads and pads over several years, limited to the Project construction phase. Constructed if and when needed, CPAI's ice roads and pads would last through individual winter seasons and melt the following summer. While ice roads and pads in the NPR-A generally result in temporary, observable changes to the tundra, these become less conspicuous with each passing year (Guyer and Keating 2005, Yokel et al. 2007), and when visible, are mostly discernable from the air and difficult to observe from ground level. As such, ice infrastructure would not result in lasting visual, audible, or olfactory changes to the landscapes observable from sites in the APE outside the Project footprint—especially changes of a scale that could diminish aspects of integrity related to cultural properties' surroundings (e.g., setting, feeling, or association). CPAI's proposed temporary ice road/pad and MTI infrastructure are therefore unlikely to result in permanent or long-term visual, audible, or olfactory changes to any of these sites.

1.5.3 Cumulative Effects*

Section 3.20, *Cumulative Effects*, of this Supplemental EIS addresses the potential for Project impacts to accumulate with those associated with past, present, and RFFAs, and what those effects might be. While increasing oil and gas and transportation projects relating to the Project can potentially adversely affect historic properties, the majority of lands or coastal regions on or along the North Slope are managed or owned by either Federal agencies or the State of Alaska. Future activities connected to the Project within Federally managed areas or on State of Alaska lands would be subject to Section 106 of the NHPA or the Alaska Historic Preservation Act, respectively. Similarly, any future actions connected to the Project that occur outside state of Federal lands, but with a federal nexus (including rights-of-way) would be subject to Section 106 of the NHPA. Therefore, RFFAs resulting from the Project are not expected to result in cumulative effects to historic properties, cultural resources, or paleontological sites.

Climate change associated with the cumulative effects of past, present, and future oil and gas development could adversely affect cultural and paleontological resources, although the degree to which this might happen remains unclear. Deepening active layers and the near-surface permafrost thaw can cause mass wasting (French 2007; Washburn 1980), resulting in partial or total destruction of the cultural and paleontological sites as the landforms on which they are located erode; these circumstances are also greatly exacerbated by increased moisture. Arctic warming has also been linked to changes in sea ice dynamics and increased and rapid erosion along the Arctic coast (Frederick, Thomas et al. 2016; Gibbs and Richmond 2015; Gibbs, Snyder et al. 2019). A warming environment and permanent or seasonal permafrost thaw can enhance degradation of organic remains, vertical and horizontal spatial relationships between objects, and the information they may yield (BLM 2012, 382; French 2007; Washburn 1980; Wood and Johnson 1978).

However, any potential effects attributable to climate change are not expected to be universal or predictable across the APE, as myriad factors influence the degree to which climate change can affect a specific location, region, habitat, or ecosystem. Climate Change may affect some locales substantially, while others may not be affected at all (BLM 2012, 183). According to the Willow MDP SEIS evaluation of cumulative impacts to soils and permafrost (Section 3.20.8 Cumulative Impacts to Soils, Permafrost, and Gravel Resources), the Project

would impact soils and permafrost similar to past and present actions, and are expected to be localized, occurring within 100 meters of infrastructure. While the Willow MDP is expected to contribute to cumulative effects to soils and permafrost overall, it is not currently possible to predict where impacts from the Project would occur, to what extent they would occur, or if those effects would adversely affect historic properties.

Although improving access to cultural resource locations (such as through road construction into otherwise remote areas) correlates strongly with increased instances of vandalism and looting of cultural resources sites (Hedquist, Ellison et al. 2014; Spangler, Arnold et al. 2006), these impacts are improbable due to CPAI's operation procedures, conditions specific to the Project area, and the Project timing. CPAI would control access to Project infrastructure and limit public access and would require its staff to undergo cultural awareness training prior to deployment per ROP I-1 (Table F.1.3). Cultural awareness training would inform personnel on how to identify and avoid disturbing archaeological materials, thereby reducing the risk of inadvertent disturbance of culturally significant sites. Of those sites situated near proposed Project infrastructure, most are either located near temporary ice infrastructure or already accessible by existing permanent infrastructure; very few sites are located near proposed new permanent infrastructure. Improved access to sites by ice infrastructure would occur temporarily over the span of several years during the Project construction phase. Ice road access would also only occur during winter seasons in which frozen and snow-covered conditions would hinder surface visibility and soil erodibility and penetrability, thus limiting the likelihood of illegal collection, subsidence, and erosion due to increased access to an area. While permanent gravel roads could improve access to sites year-round to some degree, environmental conditions and required offroad travel would still promote site preservation. As with ice road access, winter conditions would hinder surface visibility and freeze the underlying sediments, limiting the likelihood of illegal collection, subsidence, and erosion. The surrounding terrain complicates any improved access during summer months, as the tundra during this season is uneven, frequently inundated, and spongy, thereby making off-road travel in the Project area during summer months is suboptimal by foot or vehicle.

1.6 Conclusion

The protections afforded by the placement of Project components relative to documented cultural and paleontological sites (Table F.1.2), the LSs and ROPs (particularly site avoidance and staff training; Table F.1.3), the seasonal timing of project components, and accessibility difficulties during winter and summer conditions are suitable to avoid impacts to cultural and paleontological resources by the range of activities or potential activities connected to the proposed undertaking. It is, thus, unlikely that the proposed Project would result in direct or indirect adverse impacts to cultural or paleontological resources

Table F.1.1. List of Cultural and Paleontological Sites in the Analysis Area According to the Alaska Heritage Resource Survey and the Traditional Land Use Inventory Data*

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00002	—	HAR-00002	Prehistoric	Not Eligible	Destroyed
HAR-00005	—	Sod House and Boat on Fish Creek	Historic (Iñupiaq)	No Determination	Intact
HAR-00010	—	Kikkaq	Historic (Iñupiaq)	No Determination	Intact
HAR-00011	TLUIHAR011	Sikulik (Grave location)	Historic, Modern (Iñupiaq)	No Determination	Intact
HAR-00014	—	HAR-00014 Reindeer Corral	Historic (Iñupiaq)	Eligible	Partially Destroyed
HAR-00018	—	Ahsogeak Site	Historic (Iñupiaq)	Eligible	Excavated
HAR-00021	—	Niglivik 1 (original anticipated location for Niglivik based on original TLUI, later determined to be HAR-00080)	Historic (Iñupiaq)	No Determination	No Site: Erroneous Location in AHRS
HAR-00025	TLUIHAR060	Tikigaqmiut/Tikibaq (Cemetery)	Historic (Iñupiaq)	No Determination	Unconfirmed
HAR-00026	TLUIHAR091	Atigaru Point/Atibruk (Sod house ruin; gravesite; fishing, trapping, hunting, and camping area)	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00027	TLUIHAR038	Kanigluq/Kangiqluk (Sod house ruin; fishing and hunting area)	Historic (Iñupiaq)	Eligible	Threatened
HAR-00029	TLUIHAR089	Ikkalipik (Sod house ruin; fishing and trapping area)	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00032	—	Pa, D306t	Paleontological	NA	Intact
HAR-00033	—	Pa, 34571 Observation Point (Blm Ak-83-V)	Paleontological	NA	Intact
HAR-00034	—	Pa, Ocean Point	Paleontological	NA	Intact
HAR-00035	—	Pa, Ocean Point	Paleontological	NA	Intact
HAR-00036	—	Pa, D306, Loc. 1	Paleontological	NA	Intact
HAR-00038	—	PA, Carter Et Al. 1978 Site A	Paleontological	NA	Intact
HAR-00040	—	Pa, 7	Paleontological	NA	Intact
HAR-00045	—	Old Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00046	—	Leavitt Family Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00048	—	HAR-00048	Historic (Iñupiaq)	No Determination	Intact
HAR-00049	—	HAR-00049	Historic (Iñupiaq)	No Determination	Intact
HAR-00055	—	Caribou Bone	Modern (Faunal)	No Determination	Destroyed
HAR-00057	—	Pa, Mammoth Femur Sticking Vertically from Ground	Paleontological	NA	Excavated
HAR-00060	—	Pa, Old Bone Beach	Paleontological	NA	Intact
HAR-00061	—	Pa, Liscomb Bed	Paleontological	NA	Intact
HAR-00067	—	HAR-00067	Paleontological	NA	Excavated

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00073	—	HAR-00073	Prehistoric (Denbigh, ASTt)	No Determination	Intact
HAR-00075	—	Metatarsal Bar	Paleontological	NA	Disturbed
HAR-00080	TLUIHAR030	Niglivik/Niblivik (Fishing and hunting area)	Historic (Iñupiaq)	No Determination	Intact
HAR-00081	—	Reindeer Corral, Uqalium Kanigana, Uqalik Corral	Historic (Iñupiaq)	No Determination	Intact
HAR-00089	TLUIHAR081	Nappaun (Napaun) (Sod house ruin)	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00090	—	Niglivigauraq Creek 1	Historic (Iñupiaq)	No Determination	Intact
HAR-00091	—	Niglivigauraq Creek 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00098	—	SRBA 2012 C3	Prehistoric	No Determination	Intact
HAR-00100	—	HAR-00100	Prehistoric	No Determination	Intact
HAR-00101	—	HAR-00101	Prehistoric	No Determination	Intact
HAR-00105	—	Drained Lake Blowout	Prehistoric	No Determination	Could not be located (2018, 2020)
HAR-00106	—	HAR-00106	Prehistoric	No Determination	Intact
HAR-00107	—	HAR-00107	Prehistoric	No Determination	Intact
HAR-00108	—	HAR-00108	Historic, Modern (Iñupiaq)	No Determination	Intact
HAR-00109	—	Sod Feature	Prehistoric	No Determination	Intact
HAR-00110	—	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00111	—	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00112	—	Akulik	Historic (Iñupiaq)	No Determination	Intact
HAR-00119	—	HAR-00119	Historic (Iñupiaq)	No Determination	Intact
HAR-00120	—	HAR-00120	Historic (Iñupiaq)	No Determination	Intact
HAR-00121	—	Navy Debris	Historic (Euroamerican)	No Determination	Intact
HAR-00151	—	HAR-00151	Historic (Euroamerican)	No Determination	Intact
HAR-00154	—	Katairuaq Grave	Historic (Iñupiaq)	No Determination	Intact
HAR-00156	TLUIHAR082	Nanuq (Fishing area; bird nesting area)	Historic (Iñupiaq)	No Determination	Intact
HAR-00157	—	Niglivik 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00158	—	Putu	Historic (Iñupiaq)	No Determination	Disturbed
HAR-00167	—	Kayuqtusilik	Historic (Iñupiaq)	No Determination	Intact
HAR-00168	—	Aqsiataaq Inaat	Historic (Iñupiaq)	No Determination	Intact
HAR-00170	—	Mammoth Bone	Paleontological	NA	Destroyed
HAR-00172	—	HAR-00172	Prehistoric	No Determination	Intact
HAR-00173	—	Colville #1 Peat Road	Historic (Euroamerican)	Eligible	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
TES-00028	TLUITES222	Kolovik/Qalluvik (Former village site (peak population 1930s); houses, whale boats, cabin)	Historic (Iñupiaq)	Eligible	Threatened
TES-00029	—	Pa, 2	Paleontological	NA	Intact
TES-00030	—	Pa, 6	Paleontological	NA	Intact
TES-00032	—	Building 1, Dew Operations Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00033	—	Building 2, Maintenance Shop Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00034	—	Building 12, Supply and Equipment Warehouse Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00035	—	Building 13, Pump Station Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00036	—	Building 15, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00037	—	Building 17, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00038	—	Building 18, Aircraft Shelter Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00039	—	Building 19, Air Freight and Passenger Terminal Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00040	—	Building 20, Warehouse Supply and Equipment Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00041	—	Building 100, Radome Tower Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00042	—	Building 101, Electric Power Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00043	—	Gravel Structures Lonely SRRS Road System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00044	—	Gravel Structures Lonely SRRS Airfield	Historic (Euroamerican)	Eligible	Intact
TES-00045	—	Gravel Structures Lonely SRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00048	—	POW-1	Historic (Euroamerican)	Eligible	Destroyed
TES-00120	—	Point Lonely Graves	Historic (Iñupiaq)	No Determination	Intact
TES-00121	—	TES-00121	Historic (Iñupiaq)	No Determination	Intact
XBP-00002	—	Oliktok Point	Historic (Euroamerican)	No Determination	Intact
XBP-00033	—	Kuparuk Pingo	Prehistoric (Northern Archaic)	No Determination	Excavated

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
XBP-00036	TLUIXBP016	Ugrugnavik River (Gravesite; frame and sod houses, cellar)	Historic (Iñupiaq)	No Determination	Could not be located (1996, 2005)
XBP-00037	—	Thetis Pingo	Prehistoric, Historic (Iñupiaq, Euroamerican)	No Determination	Disturbed
XBP-00039	—	Pow-2	Historic (Euroamerican)	Eligible	Intact
XBP-00050	—	Building 1, Civilian Camp Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00051	—	Building 2, Vehicle Maintenance Shop Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00052	—	Building 3, Aircraft Shelter Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00053	—	Building 8, Supply and Equipment Warehouse Oliktok Dew Line Facilities	Historic, Modern (Euroamerican)	Eligible	Intact
XBP-00054	—	Building 17, Fuel Pump Station Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00055	—	Building 18, Weather Building Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00057	—	Gravel Structures Oliktok LRRS Road System	Historic (Euroamerican)	Eligible	Intact
XBP-00058	—	Gravel Structures Oliktok LRRS Airfield	Historic (Euroamerican)	Eligible	Intact
XBP-00059	—	Gravel Structures Oliktok LRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Intact
XBP-00119	—	Ugnuravik Pingo	Historic (Iñupiaq)	No Determination	Intact
—	TLUIHAR006	Inibruat (Ruin; hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR007	Narvabauraq (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR012	Sikulik Lake (No description available)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR015	Savikpaligauram Leitublia (Sod house ruin; fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR017	Ayuvieam Ixuvia (Gravesite and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR023	Ayuviea (Hunting area; placename derived from person)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR027	Qitiq (Hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR031	Niblivigauram Narvafi (Fishing, trapping, and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR032	Itivliqpak (Placename)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR033	Niblivigauram Narvafa (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR035	Tifmiaqpalik (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR059	Apkugaruk (Fishing area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR065	Sabviavik (Fishing area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR066	Anagguvik (Fishing and trapping area; berry and coal gathering)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR068	Tiglak (Fishing and trapping area; berry and coal gathering)	Historic (Iñupiaq)	NA	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
—	TLUIHAR069	Putu (Former trading post with ruins; current hunting and camping area)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR079	Kayuqtusilik (Sod house ruin and gravesite)	Historic (Iñupiaq)	NA	Intact
—	TLUIHAR103	Sigiaruk (Fishing, hunting, and camping area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES104	Abnaqsraq (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES216	Ayagutaq (Hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES217	Nalluabruum Paafa (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES218	Sisamalik (Hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES220	Tasibaabruk (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES221	Afupqan Ieitublia (Sod house ruin, hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES225	Natibnauraq (Hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES226	Kifiefuq (Hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES227	Qiruktabiaq (Driftwood collecting area; hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES229	Igluqabvialuk (Hunting area; possible house ruins)	Historic (Iñupiaq)	NA	Intact
—	TLUITES230	Tigutaam Paafa (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES233	Kuvrabliq (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES238	Tigutaam Kuufa (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUITES244	Tigutaaq (Fishing and hunting area)	Historic (Iñupiaq)	NA	Intact
—	TLUIXBP013	Sannifaruaq (Sod house ruin; gravesites)	Historic (Iñupiaq)	NA	Intact
—	TLUIXBP014	Uuliktuq (Gravesite; old store site)	Historic (Iñupiaq)	No Determination	Partially Destroyed
—	TLUIXBP015	Ufurabvik (Ice cellars)	Historic (Iñupiaq)	NA	Intact

Notes: — (no data); AHRS (Alaska Heritage Resources Survey); NA (not applicable); No. (number); NRHP (National Registry of Historic Places); TLUI (Traditional Land Use Inventory); all destroyed, excavated, and non-locatable sites in the Area of Potential Effects are indicated by dark gray shading.

Table F.1.2 Extant Sites Relative to Proposed Project Infrastructure*

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
HAR-00005	No	—	1.15	0.46	Pipeline	Option 2 Module Haul Route Ice Road
HAR-00010	No	—	>2.50	1.25	Pipeline	Option 3 Ocean Point Crossing Ice Road
HAR-00011	No	TLUIHAR011	>2.50	2.06	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
HAR-00014	No	—	>2.50	1.79	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Route Ice Road
HAR-00025	No	TLUIHAR060	>2.50	2.17	BT4 (Alternatives B, C, D)	Option 1 Module Haul Route Ice Road
HAR-00027	No	TLUIHAR038	>2.50	1.55	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
HAR-00032	Yes	—	>2.50	0.49	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00033	Yes	—	>2.50	1.9	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00034	Yes	—	>2.50	0.93	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00035	Yes	—	>2.50	1.05	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00036	Yes	—	>2.50	0.68	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00038	Yes	—	2.38	1.92	BT2 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
HAR-00040	Yes	—	>2.50	0.84	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Route Ice Road
HAR-00045	No	—	>2.50	1.92	BT4 (Alternatives B, C, D)	Option 1 Module Haul Route Ice Road
HAR-00046	No	—	>2.50	2.15	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Route Ice Road
HAR-00048	No	—	1.21	0.67	BT4 Road (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
HAR-00049	No	—	1.35	0.82	BT4 Road (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
HAR-00060	Yes	—	>2.50	1.73	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00061	Yes	—	>2.50	2.19	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00073	No	—	>2.50	0.14	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
HAR-00075	Yes	—	>2.50	1.64	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00080	No	TLUIHAR030	>2.50	1.33	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
HAR-00081	No	—	>2.50	2.48	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
HAR-00090	No	—	>2.50	0.84	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
HAR-00091	No	—	>2.50	0.79	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
HAR-00098	No	—	2.45	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
HAR-00100	No	—	>2.50	0.21	BT4 (Alternatives B, C, D)	Option 1 Module Haul Route Ice Road
HAR-00101	No	—	>2.50	1.73	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Ice Road
HAR-00106	No	—	>2.50	1.15	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
HAR-00107	No	—	>2.50	1.06	Pipeline	Option 3 Module Haul Route Ice Road
HAR-00108	No	—	>2.50	1.19	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Ice Road
HAR-00109	No	—	1.15	1.15	BT4 (Alternatives B, C, D)	BT4 Gravel Haul Ice Road
HAR-00110	No	—	1.76	1.75	BT4 (Alternatives B, C, D)	BT4 Gravel Haul Ice Road
HAR-00111	No	—	>2.50	1.38	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Ice Road
HAR-00112	No	—	>2.50	1.66	BT4 (Alternatives B, C, D)	Option 1 Gravel Haul Ice Road
HAR-00119	No	—	>2.50	1.99	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Ice Road
HAR-00120	No	—	>2.50	2.31	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Ice Road

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
HAR-00121	No	—	1.64	1.61	BT4 (Alternatives B, C, D)	BT4 Gravel Haul Ice Road
HAR-00151	No	—	>2.50	1	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Ice Road
HAR-00154	No	—	>2.50	1.71	Mine Site 1 Berm	Option 3 Module Haul Route Ice Road
HAR-00156	No	TLUIHAR082	0.05	>2.50	Pipeline	Mine Site River Crossing Ice Road
HAR-00157	No	—	2.44	>2.50	Pipeline	Mine Site River Crossing Ice Road
HAR-00158	No	—	1.64	>2.50	HDD West Pipeline Pad	Mine Site River Crossing Ice Road
HAR-00167	No	—	>2.50	1.63	Mine Site 1 Berm	Option 3 Module Haul Route Ice Road
HAR-00168	No	—	>2.50	2.07	Mine Site Berm	Option 3 Module Haul Route Ice Road
HAR-00172	No	—	>2.50	0.8	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
HAR-00173	No	—	0	>2.50	Pipeline	Option 3 Module Haul Route Ice Road
TES-00028	No	TLUITES222	>2.50	2.46	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
TES-00029	Yes	—	>2.50	2.44	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
TES-00030	Yes	—	>2.50	0.85	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
TES-00043	No	—	>2.50	0	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
TES-00044	No	—	>2.50	0.11	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
TES-00045	No	—	>2.50	0.12	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
TES-00120	No	—	>2.50	0.1	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
TES-00121	No	—	>2.50	2.33	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
XBP-00002	No	—	1.87	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00037	No	—	>2.50	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00039	No	—	0.84	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
XBP-00050	No	—	1.34	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00051	No	—	1.25	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00052	No	—	1.2	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00053	No	—	1.33	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00054	No	—	1.44	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00055	No	—	1.29	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00057	No	—	>2.50	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00058	No	—	0.87	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00059	No	—	1.18	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
XBP-00119	No	—	>2.50	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
—	No	TLUIHAR006	>2.50	0.39	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUIHAR007	>2.50	0.61	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIHAR012	>2.50	0.81	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUIHAR015	>2.50	0.35	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIHAR017	>2.50	1.3	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUIHAR023	>2.50	1.51	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIHAR027	>2.50	0.69	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
—	No	TLUIHAR031	>2.50	1.14	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUIHAR032	>2.50	1.27	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUIHAR033	>2.50	1.51	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIHAR035	>2.50	1.96	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIHAR059	0.14	>2.50	Pipeline	Mine Site River Crossing Ice Road
—	No	TLUIHAR065	>2.50	0.32	Pipeline	Option 3 Module Haul Route Ice Road
—	No	TLUIHAR066	>2.50	2.11	Pipeline	Option 3 Module Haul Route Ice Road
—	No	TLUIHAR068	>2.50	0.68	Pipeline	Option 3 Module Haul Route Ice Road
—	No	TLUIHAR069	>2.50	2.28	Mine Site 1 Berm	Option 3 Module Haul Route Ice Road
—	No	TLUIHAR079	1.76	>2.50	Pipeline	Mine Site River Crossing Ice Road
—	No	TLUIHAR103	0.93	2	Pipeline	Mine Site River Crossing Ice Road
—	No	TLUITES104	>2.50	0.84	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUITES216	>2.50	1.23	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
—	No	TLUITES217	>2.50	2.15	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUITES218	>2.50	0.3	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUITES220	>2.50	0.5	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
—	No	TLUITES221	>2.50	1.11	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road
—	No	TLUITES225	>2.50	1.93	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUITES226	>2.50	>2.50	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUITES227	>2.50	>2.50	BT4 (Alternatives B, C, D)	Option 2 Module Offload Ice Road

AHRS No.	Paleontological Site (Yes/No)	TLUI No.	Distance: Nearest Permanent Infrastructure (miles)	Distance: Nearest Temporary Infrastructure (miles)	Nearest Permanent Project Component	Nearest Temporary Project Component
—	No	TLUITES229	>2.50	>2.50	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUITES230	>2.50	1.61	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUITES233	>2.50	1.29	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUITES238	>2.50	1.44	BT4 (Alternatives B, C, D)	Option 2 Module Haul Route Ice Road
—	No	TLUITES244	>2.50	1.05	BT4 (Alternatives B, C, D)	Option 2 Gravel Haul Route Ice Road
—	No	TLUIXBP013	>2.50	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
—	No	TLUIXBP014	1.27	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road
—	No	TLUIXBP015	1.57	>2.50	Option 3 Transport Road/Curve Widening	Option 3 Module Haul Route Ice Road

Note: — (no data); > (greater than); AHRS (Alaska Heritage Resources Survey); NA (not applicable); No. (number); TLUI (Traditional Land Use Inventory).

Table F.1.3. Summary of Applicable Lease Stipulations and Required Operating Procedures Intended to Mitigate Impacts to Cultural Resources*

LS or ROP	Description or Objective	Requirement/Standard
ROP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	a. Ground operations shall be allowed only when frost and snow cover are sufficient to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 15); the exact dates will be determined by the AO. b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year. f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River.
ROP E-13	Protect cultural and paleontological resources.	Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee shall notify the AO and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the AO.

LS or ROP	Description or Objective	Requirement/Standard
ROP I-1	Minimize cultural and resource conflicts.	All personnel shall be provided information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. All personnel involved in permitted activities shall attend an orientation program at least once a year and the orientation program should: a. Provide sufficient detail to notify personnel of applicable stipulations and ROPs, as well as specific types of environmental, social, and traditional and cultural concerns that relate to the region. b. Address the importance of not disturbing archaeological and biological resources and habitats, and provide guidance on how to avoid disturbance. c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species. d. Be designed to increase sensitivity and understanding of local community values, customs, and lifestyles. e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation. f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site. h. Include on-site records of all personnel who attend the program for so long as the site is active. i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans. j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel. k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities.
LS K-1	*River Setbacks* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.	*River Setbacks* Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by case basis, essential pipeline and road crossings will be permitted through setback areas. a. Colville River: A 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to the juncture of Thunder and Storm creeks, the setback is 0.5 mile. b. Fish Creek: A 3-mile setback from the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a 0.5-mile setback farther upstream. c. Judy (Kayyaak) Creek: A 0.5-mile setback. d. Ublutuoch (Tiŋmiaqsiuġvik) River: a 0.5-mile setback.

Source: BLM 2022.
Note: AO (authorized officer); BLM (Bureau of Land Management); LS (lease stipulation); NPR-A (National Petroleum Reserve in Alaska); ROP (required operating procedure).

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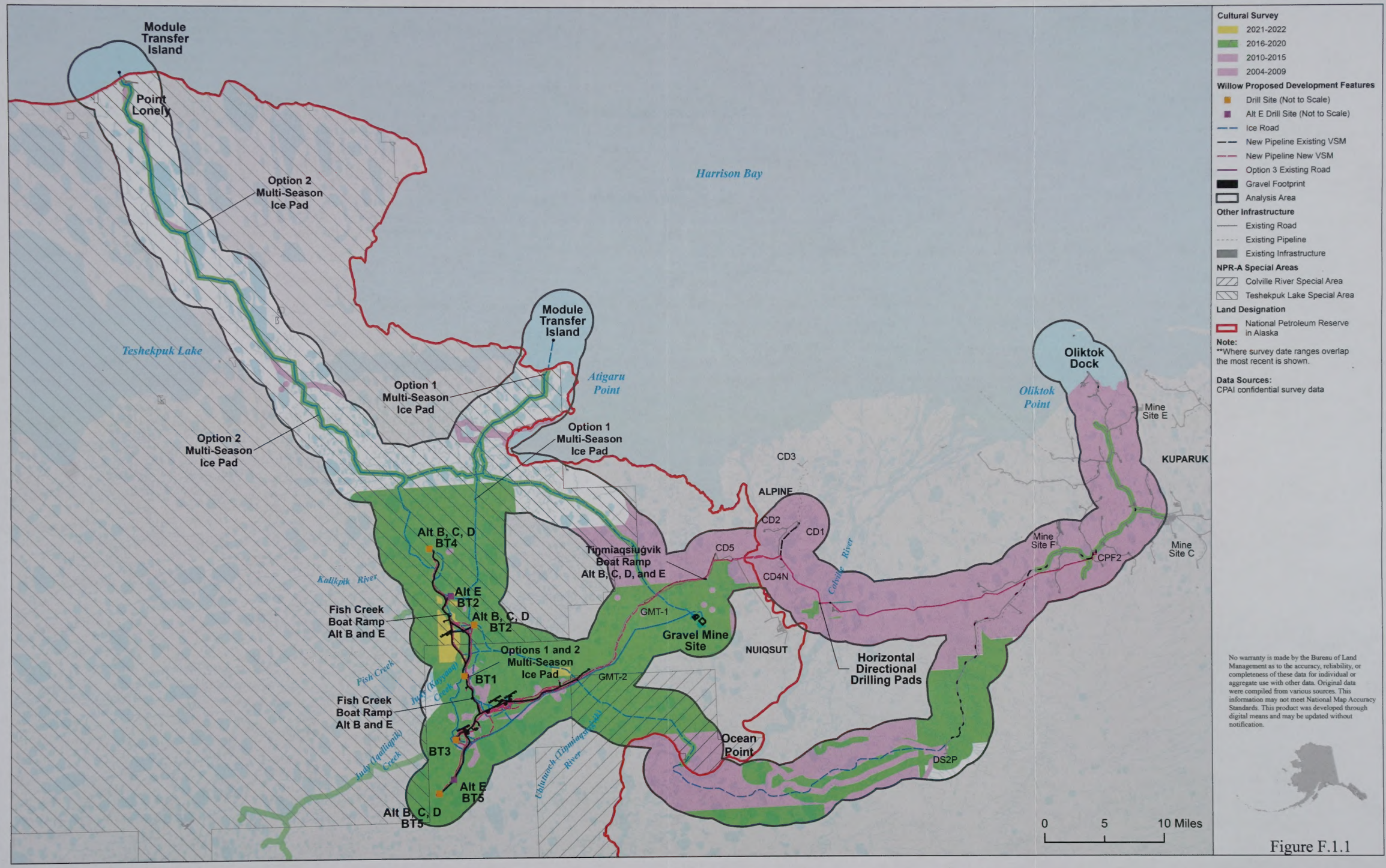
Module Transfer Island
Point Lonely
Option 2 Multi-Season Ice Pad
Harrison Bay
Teshekpuk Lake
Module Transfer Island
Atigaru Point
Option 1 Multi-Season Ice Pad
Option 1 Multi-Season Ice Pad
Option 2 Multi-Season Ice Pad
Oliktok Dock
Oliktok Point
Mine Site E
KUPARUK
CD3
ALPINE
CD2
CD1
CD5
CD4N
Colville River
Mine Site F
CPF2
Mine Site C
Alt B, C, D BT4
Tiŋmiaqsiuġvik Boat Ramp Alt B, C, D, and E
Kalikpik River
Alt E BT2
Fish Creek Boat Ramp Alt B and E
Alt B, C, D BT2
GMT-1
4D Gravel Mine Site
NUIQSUT
Options 1 and 2 Multi-Season Ice Pad
BT1
GMT-2
Horizontal Directional Drilling Pads
Fish Creek
Judy (Kayyaaq) Creek
Fish Creek Boat Ramp Alt B and E
Judy (Iqalliqpik) Creek
BT3
Ocean Point
DS2P
Alt E BT5
Alt B, C, D BT5
Ublutuoch (Tiŋmiaqsiuġvik) River
0 5 10 Miles
Cultural Survey
2021-2022
2016-2020
2010-2015
2004-2009
Willow Proposed Development Features
Drill Site (Not to Scale)
Alt E Drill Site (Not to Scale)
Ice Road
New Pipeline Existing VSM
New Pipeline New VSM
Option 3 Existing Road
Gravel Footprint
Analysis Area
Other Infrastructure
Existing Road
Existing Pipeline
Existing Infrastructure
NPR-A Special Areas
Colville River Special Area
Teshekpuk Lake Special Area
Land Designation
National Petroleum Reserve in Alaska
Note:
**Where survey date ranges overlap the most recent is shown.
Data Sources:
CPAI confidential survey data
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure F.1.1

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Willow Master Development Plan

Appendix G
Alaska National Interest Lands Conservation Act Section 810 Analysis

January 2023

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List of Acronyms and Abbreviations

ANILCA	Alaska National Interest Lands Conservation Act
ATV	all-terrain vehicle
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BT1	Bear Tooth drill site 1
BT2	Bear Tooth drill site 2
BT3	Bear Tooth drill site 3
BT4	Bear Tooth drill site 4
BT5	Bear Tooth drill site 5
BTU	Bear Tooth Unit
CAA	Conflict Avoidance Agreement
CAH	Central Arctic Caribou Herd
CPAI	ConocoPhillips Alaska, Inc.
CRD	Colville River Delta
DS2P	Kuparuk drill site 2P
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
GMT	Greater Mooses Tooth
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
GMU	Game Management Unit
IAP/EIS	Integrated Activity Plan/Environmental Impact Statement
Kuukpik	Kuukpik Corporation
MTI	module transfer island
NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve in Alaska
NPRPA	Naval Petroleum Reserves Production Act
Project	Willow MDP Project
ROD	Record of Decision
ROP	required operating procedures
SDEIS	Supplement to the Draft EIS
TCH	Teshekpuk Caribou Herd
WAH	Western Arctic Herd
Willow MDP	Willow Master Development Plan
WOC	Willow Operations Center
WPF	Willow Processing Facility

Note to Readers*

To assist readers in identifying new information in this Supplemental EIS, new or substantially revised text is highlighted in light yellow (as shown in this paragraph). Substantial revisions include changes to the text or underlying data that have changed the analysis or analysis conclusion. All sections that are new or include significant or substantial revisions include an asterisk ("*") at the end of the section header; all new or substantially revised tables and figures also include an asterisk at the end of the table or figure caption.

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ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT SECTION 810 ANALYSIS OF SUBSISTENCE IMPACTS*

This analysis of subsistence impacts is for the Willow Master Development Plan (Willow MDP) Supplemental Environmental Impact Statement (EIS). ConocoPhillips Alaska, Inc. (CPAI) is seeking approval to develop and produce oil from leases in the Bear Tooth Unit (BTU) of the National Petroleum Reserve in Alaska (NPR-A) via four or five drill sites and pipelines that would connect to the Greater Mooses Tooth 2 (GMT-2) development and existing Alpine development facilities in the Colville River Delta (CRD). The Project would include its own processing facility, an operations center, ice and gravel roads, and either one or two airstrips depending on the selected alternative. The Project would be located on the North Slope of Alaska in the northeast section of the NPR-A, west of the Colville River, CRD, and the community of Nuiqsut; however, module delivery facilities and related ice roads would also be located to the east and south of Nuiqsut, including a crossing of the Colville River. The original Willow MDP EIS was finalized in August 2020. This Supplemental EIS was prepared in response to the United States District Court of Alaska's 2021 decision remanding the Willow MDP EIS to the Bureau of Land Management (BLM) for the purpose of addressing National Environmental Policy Act (NEPA) deficiencies. A key revision of the Supplemental EIS was the addition of a fourth action alternative (Alternative E), which reduces infrastructure within the Teshekpuk Lake Special Area (TLSA) relative to the previously analyzed action alternatives.

The proposed Project drill sites and the majority of operational infrastructure would be located on federal lands in the NPR-A managed by the BLM. Some supporting infrastructure (e.g., portions of the gravel access road, temporary ice roads, and pipelines) would be located on lands owned by the Kuukpik Corporation (Kuukpik) and the State of Alaska. Conveyed and selected Native (Kuukpik) lands would include portions of Project pipelines, roads, and Colville River pipeline crossing pads. State of Alaska lands would include portions of Project pipelines. Three of the four Willow MDP Supplemental EIS alternatives analyzed include a gravel road connection from the GMT-2 drill site to the Project area. All of the action alternatives include a pipeline that would connect Project drill sites to existing pipeline infrastructure to the east.

The Willow MDP Supplemental EIS considers four alternatives and three module delivery options, in addition to a No Action Alternative (Alternative A). While the Willow MDP Supplemental EIS analysis provides an evaluation for the four Willow MDP EIS action alternatives and three module delivery options separately, any final subsistence determinations should consider the implementation of alternatives in combination with each of the module delivery options because one of the three options would occur under any action alternative. The four Willow MDP action alternatives include the Proponent's Project (Alternative B), which includes a gravel access road connecting the Project to the existing GMT-2 and Alpine developments; Disconnected Infield Roads (Alternative C), which reduces the gravel footprint but maintains a year-round gravel road connection to the existing GMT-2 and Alpine developments; Disconnected Access (Alternative D), which does not include a year-round gravel access road connection to the existing GMT-2 and Alpine developments; and Three-Pad Alternative, Fourth Pad Deferred (Alternative E), which eliminates drill site BT4 and moves drill site BT2 north. The three module delivery option alternatives include the Atigaru Point Module Transfer Island (MTI) (Option 1); the Point Lonely Module Transfer Island (Option 2); and the Colville River Crossing (Option 3). Each of these options would construct ice road connections to the Project area, and two of the options (Options 1 and 2) would construct a man-made island to support gravel hauling and module transport. Either MTI would be located in State of Alaska waters, while other associated infrastructure (e.g., ice roads, ice pads) would be located on federal lands in the NPR-A.

Chapter 3.0, *Affected Environment and Environmental Consequences*, of the Willow MDP Supplemental EIS describes the current environmental status of the Project area and potential effects of the alternative development scenarios to the physical, biological, and social environment. In particular, Section 3.16, *Subsistence and Sociocultural Systems*, addresses the affected environment and environmental consequences for subsistence, traditional use, and sociocultural systems. Other relevant sections include Section 3.10, *Fish*; Section 3.11, *Birds*; Section 3.12, *Terrestrial Mammals*; Section 3.13, *Marine Mammals*; and Section 3.18, *Public Health*. This analysis uses that information to evaluate potential impacts to subsistence uses and needs pursuant to Section 810(a) of the Alaska National Interest Lands Conservation Act (ANILCA). This analysis is organized to inform BLM's findings of significance based on the factors listed below (Section A). While the Willow MDP Supplemental EIS provides both a description of the affected environment and an analysis of the environmental

consequences of the Project, this document provides an evaluation of the potential impacts of the Project on subsistence uses and needs, followed by BLM's findings of significance for each Project alternative and the cumulative case.

A. SUBSISTENCE EVALUATION FACTORS*

Section 810(a) of ANILCA, 16 USC 3120(a), requires that an evaluation of subsistence uses and needs must be completed for any federal determination to "withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands." All of the Project's proposed drill sites, Willow Processing Facility (WPF), Willow Operations Center (WOC), gravel roads, air strip(s), and sections of associated pipelines and ice roads would be located on BLM-managed public lands under all action alternatives. Thus, an evaluation of potential impacts to subsistence under ANILCA Section 810(a) must be completed for the Willow MDP Supplemental EIS. All impacts to subsistence uses and needs are evaluated herein regardless of land status.

ANILCA requires that this evaluation include findings on three specific issues:

1. The effect of use, occupancy, or disposition on subsistence uses and needs.
2. The availability of other lands for the purposes sought to be achieved.
3. Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC Section 3120(a)).

In this analysis, four factors are considered when determining if a significant restriction of subsistence uses and needs may result from the proposed action and alternatives, or in the cumulative case:

1. A reduction in the abundance of harvestable resources.
2. A reduction in the availability of resources used for subsistence purposes caused by alteration in their distribution, migration, or location.
3. A limitation on the access of subsistence users to harvestable resources.
4. An increase in competition from non-federally qualified users, resulting in a disruption to the continuation of subsistence uses.

Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment*, and Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*, provide information on areas and resources important for subsistence use, and the degree of dependence of Nuiqsut and Utqiaġvik (Barrow) on different subsistence populations. The Willow MDP Supplemental EIS Section 3.16.2, *Environmental Consequences*, provides data on subsistence resource availability and limitations that each action alternative would place on access and is used to determine whether the action alternatives may cause a significant restriction to subsistence uses.

A finding that the proposed action may significantly restrict subsistence uses imposes requirements to notify the State of Alaska and appropriate regional and local subsistence committees, hold hearings in affected communities, and make the following determinations before BLM can authorize the use of public lands:

- Such a significant restriction of subsistence uses is necessary and consistent with sound management principles for the use of the public lands.
- The proposed activity would involve the minimal amount of public lands necessary to accomplish the purposes of the use, occupancy, or other disposition.
- Reasonable steps would be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions (16 USC 3120(a)).

A proposed action or alternative would be considered to significantly restrict subsistence uses if, after consideration of stipulations or protection measures (e.g., lease stipulations and required operating procedures [ROPs]) included as a part of each alternative, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Substantial reductions in the opportunity to continue subsistence uses generally are caused by large reductions in resource abundance, a major redistribution of resources, extensive interference with access, or major increases in the use of those resources by non-subsistence users.

When analyzing the effects of Project alternatives, particular attention is paid to Nuiqsut, the community that has the potential to be most directly impacted by the Project. Nuiqsut is located on the Niġliq Channel of the Colville River, and the Project area lies within a substantial portion of the community's subsistence use area (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*, Figure 3.16.1). Additionally, the

analysis considers potential effects to Utqiaġvik because the Project would be in the eastern portion of the community's subsistence use area and some components would be close to Teshekpuk Lake, a key traditional use area for the community. The cumulative analysis expands the evaluation of potential impacts to consider areas beyond the Project area in which past activities have impacted North Slope subsistence uses, in which current activities are impacting North Slope subsistence uses, or in which future activities could occur that could impact Nuiqsut, Utqiaġvik, or other North Slope communities' subsistence uses or the subsistence resources that rely upon the habitats affected.

In addition to ANILCA, Environmental Justice, as defined in Executive Order 12898, also calls for an analysis of the effects of federal actions on minority populations with regard to subsistence. Specifically, Environmental Justice is:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

Section 4-4 of the Executive Order on Environmental Justice, regarding the Subsistence Consumption of Fish and Wildlife, requires federal agencies to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish or wildlife for subsistence, and to communicate to the public any risks associated with those consumption patterns. To this end, the action alternatives subsistence analyses, located in Section 3.16 of the Willow MDP Supplemental EIS, have been reviewed and found to comply with Executive Order 12898.

B. ANILCA SECTION 810(A) EVALUATIONS AND FINDINGS FOR ALL ALTERNATIVES AND THE CUMULATIVE CASE

Evaluations and findings for Alternatives A, B, C, D, and E, module delivery Options 1, 2, and 3, and the cumulative case are presented individually in the following sections. ROPs established by the 2022 NPR-A Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) Record of Decision (ROD) (BLM 2022) would apply to all Project alternatives. CPAI's leases in the BTU are subject to lease stipulations established in the 2008 Northeast NPR-A Supplemental IAP ROD (BLM 2008). The mitigating effects of these ROPs and lease stipulations are accounted for in the following evaluations and findings.

1. Evaluation and Finding for Alternative A (No Action)

The No Action Alternative of the Willow MDP Supplemental EIS precludes the currently proposed development in the BTU, and no oil from the BTU field would be produced. Under this alternative, no new roads, airstrips, pipelines, or other oil and gas facilities would be constructed pursuant to CPAI's proposal for development in the BTU.

Activities that are currently allowed pursuant to the 2022 NPR-A IAP/EIS ROD would continue. These activities include seismic exploration, exploratory drilling of test wells, and the construction of ice roads and pads to support these operations.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

No additional impacts to subsistence uses and needs would be expected under the No Action Alternative. Impacts in the Project area would be expected from those actions associated with scientific research during the summer and oil and gas exploration during the winter. Numerous studies are conducted on a year-round basis on the North Slope. Aerial surveys are conducted by fixed-wing aircraft or helicopter, and ground surveys are conducted on foot, snow machine, or by all-terrain vehicle (ATV); these activities have the potential to disturb wildlife. However, the effects of these activities on species used by subsistence users are expected to be local and short-term and would have no regional population effects.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation for Willow MDP Supplemental EIS Alternative A (No Action) regarding the availability of other lands is not applicable because Alternative A does not propose the disposition or use of public lands.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would eliminate the use of public lands needed for subsistence purposes. The Willow MDP Supplemental EIS Appendix D.1, *Alternatives Development*, Section 3.5.3 (*Alternative Components Considered but Eliminated from Further Analysis*) discusses other alternatives that were considered but eliminated from detailed analysis due to economic or technological feasibility or practicability, or because they did not meet the purpose of the proposed action.

d. Findings

The effects of the No Action Alternative fall below the level of possibly significantly restricting subsistence uses and needs. The impacts to subsistence resources and access discussed above would be minimal. This finding applies to the entire Project study area.

2. Evaluation and Finding for Alternative B (Proponent's Project)

Development of oil reserves in the BTU would occur under Alternative B, the Proponent's Project. Infrastructure would include five drill sites (BT1, BT2, BT3, BT4, and BT5), WPF, WOC, an all-season gravel road connection extending from the GMT-2 drill site southwest to the WPF, an airstrip, infield and export pipelines, gravel roads (including eight turnouts with subsistence/tundra access ramps and seven associated bridges) connecting the five drill sites to the WPF, and a water source access road near BT5. Gravel roads would cross both the Judy (Iqalliqpik and Kayyaaq) and Fish creeks. The Proponent would also construct up to three boat ramps for subsistence uses. One of the boat ramps, common to all action alternatives, would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and Greater Mooses Tooth 1 (GMT-1). Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish Creek pending further community input (and the selected alternative). All three boat ramps would be accessed via short roads connected to Project roads near Project bridges. During construction, the Project would also develop the Tiŋmiaqsiuġvik gravel mine site (with two distinct mine pits), a module delivery option (see Sections B.5, *Evaluation and Findings for Module Delivery Option 1: Atigaru Point Module Transfer Island;* B.6, *Evaluation and Findings for Module Delivery Option 2: Point Lonely Module Transfer Island; and Option 3: Colville River Crossing*), and associated ice roads for gravel haul and/or module transport. All action alternatives would use Oliktok Dock for the delivery of Project materials.

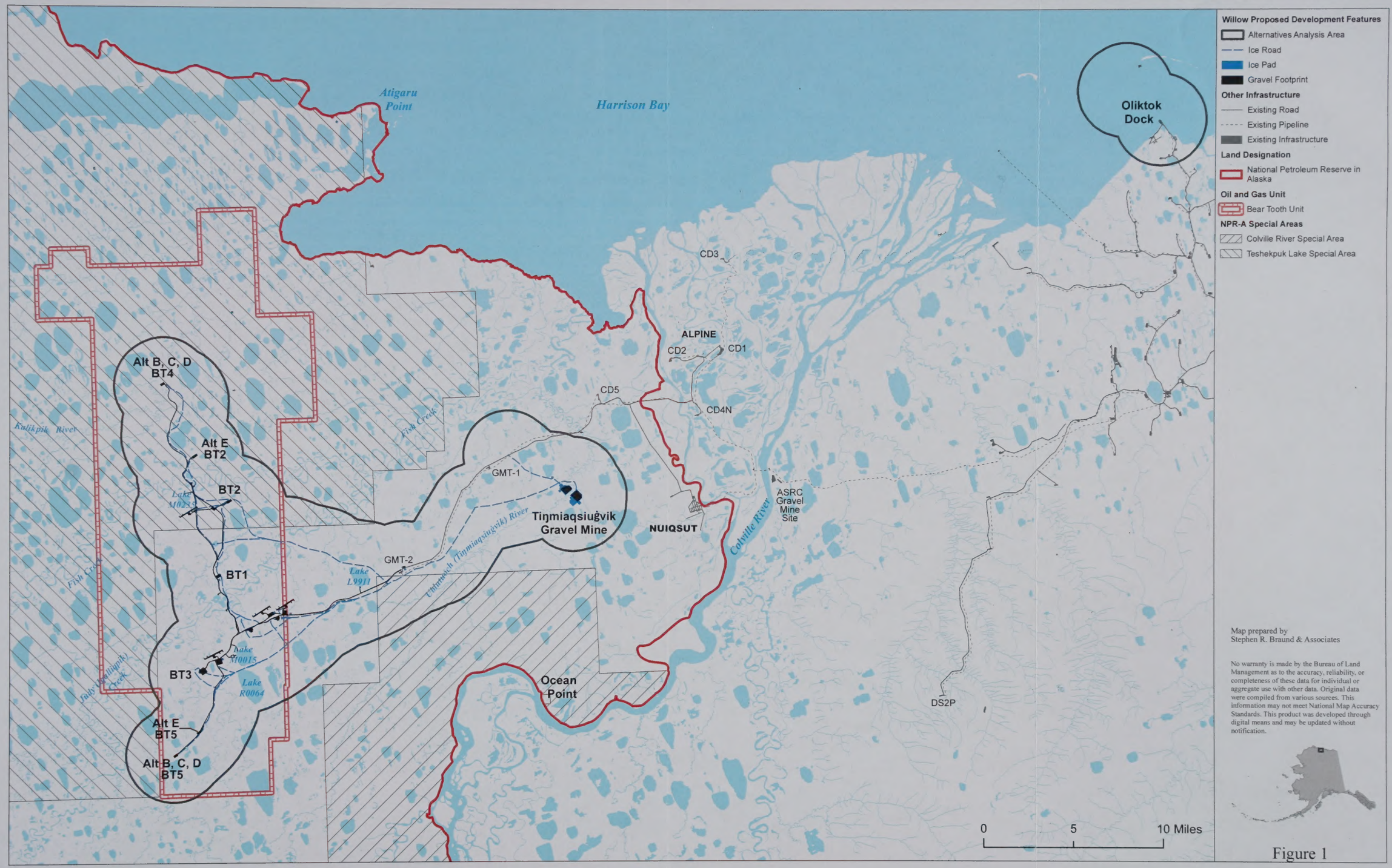
In the Willow MDP Supplemental EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary (e.g., ice roads) infrastructure associated with Alternatives B, C, D, and E, in addition to the gravel mine site, ice roads, and Oliktok Dock (Figure 1). Because the 2.5-mile buffer of the first three action alternatives is nearly identical, it was not necessary to provide a separate analysis area for each action alternative. The Alternative E 2.5-mile buffer yielded slightly different results in the subsistence analysis for one subsistence resource, and those results were provided separately. Thus, while the footprint of development infrastructure and activity is similar under all action alternatives, differences in infrastructure design, infrastructure placement, and operational details determine how and to what level subsistence uses would be affected. These differences are discussed qualitatively. The alternatives analysis area includes both permanent infrastructure and temporary infrastructure (e.g., ice roads, ice pads) that would only be present during the construction phase. The difference in impacts between the construction and operations phases are discussed qualitatively. In addition, the alternatives analysis area does not include upgrades to infrastructure or new infrastructure that would occur within the footprint of existing development areas (e.g., new pipelines that would colocate with existing pipelines and roads east of GMT-2), nor does it include all areas where development-related activity, such as air traffic, would occur. These indirect effects are discussed where applicable. While each action alternative would also include a module delivery option and associated ice roads because there is more than one module delivery option, the three options and associated ice infrastructure are analyzed separately using a separate 2.5-mile buffer (Sections B.5, B.6, and B.7).

The alternatives analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the alternatives analysis area are also addressed. In addition to the alternatives analysis area, a direct effects analysis area, which is defined as a 2.5-mile buffer around all action alternatives and module delivery options, is used in the Willow MDP Supplemental EIS Subsistence Appendix (Appendix E.16) to characterize the nature of subsistence uses, including timing and transportation methods, within the area of potential direct effects.

Willow Subsistence Alternatives Analysis Area with Proposed and Existing Infrastructure

Appendix G - ANILCA 810 Analysis

U.S. DEPARTMENT OF THE INTERIOR | BUREAU OF LAND MANAGEMENT | ALASKA | WILLOW MASTER DEVELOPMENT PLAN



Map prepared by
Stephen R. Braund & Associates

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 1

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a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The Willow MDP alternatives analysis area (Figure 1) lies within areas heavily used by Nuiqsut residents for subsistence (Figure 2), particularly for harvesting of caribou and furbearers (wolf and wolverine) with some goose hunting and limited moose and eider hunting also occurring within the alternatives analysis area. The Oliktok Dock portion of the alternatives analysis area overlaps with Nuiqsut offshore seal and eider use areas in addition to coastal caribou hunting areas. The alternatives analysis area lies within the eastern periphery of Utqiaġvik subsistence use areas for wolf, wolverine, and caribou (Figure 3). During interviews with Nuiqsut active harvesters for the 1995 through 2006 time period, 91% of harvesters reported using the alternatives analysis area for Alternatives B through D, with wolf, wolverine, and caribou being the primary targeted resources (Table 3.16.5 in the Willow MDP Supplemental EIS Section 3.16.2.3, *Alternative B: Proponent's Project*). Based on annual data for the Nuiqsut Caribou Subsistence Monitoring Project for the 2008 through 2019 time period, use of the alternatives analysis area for caribou hunting on an annual basis appears somewhat lower (between 35% and 72% of harvesters during individual study years, Table 3.16.6 in the Willow MDP Supplemental EIS Section 3.16.2.3). The percent of total caribou harvests occurring within the alternatives analysis area throughout 12 years of the Nuiqsut Caribou Subsistence Monitoring Project has ranged from 6% to 21%, with the last two study years (2018 and 2019) being on the high end at 21% and 17%, respectively. The area just east of the alternatives analysis area (defined as the area "West of Nuiqsut" in the Nuiqsut Subsistence Caribou Monitoring Project) shows even greater harvests, ranging from 14% to 65%. Recent years show an increase in harvests coming from this area (SRB&A 2021). Twelve percent of Utqiaġvik harvesters reported using the alternatives analysis area, primarily for wolf and wolverine, during the 1997 through 2006 time period.

For Nuiqsut, caribou is a resource of major importance, both culturally and as a food source, and the alternatives analysis area includes lands that are highly used for caribou hunting or lands that are directly west of areas highly used for caribou hunting (Figures 4 through 7). While furbearers generally are not a food source for the community, furbearer hunting and trapping has cultural value as it is a specialized activity, among highly active harvesters, which contributes to the local economy and provides materials for Native crafts and clothing. The alternatives analysis area is heavily used by furbearer hunters in Nuiqsut (Figures 8 and 9).

Thus, impacts to both caribou and furbearer resources are considered in this ANILCA Section 810 evaluation, in addition to indirect and cumulative impacts to other harvesting activities, such as fishing and waterfowl hunting, where applicable. Nuiqsut lies on the eastern periphery of the Teshekpuk Caribou Herd (TCH) range and the western periphery of the Central Arctic Caribou Herd (CAH) range. Estimates based on the timing and location of harvests indicate that a majority of Nuiqsut's caribou harvest is from the TCH, which is the primary herd that occurs within the alternatives analysis area (Braem, Kaleak et al. 2011). The CAH also contributes to the community's overall harvest, and caribou from this herd may cross to the west of the CRD on occasion. However, the CAH generally occurs east of the alternatives analysis area and impacts to harvests to this herd resulting from Alternative B would likely be minimal.

The alternatives analysis area is on the periphery of Utqiaġvik subsistence use areas but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents (Figure 3). The alternatives analysis area is used during some years for hunting of wolf and wolverine and may be particularly important during years when these resources are less available elsewhere (Figures 10 and 11). Caribou may also be harvested during these furbearer hunting trips, but the alternatives analysis area is generally not used specifically for Utqiaġvik caribou hunting (SRB&A 2010b). Thus, the ANILCA Section 810 evaluation focuses on potential impacts to furbearer harvesting for Utqiaġvik, in addition to indirect or cumulative impacts to other resource harvesting activities. Like Nuiqsut, furbearer hunting is practiced by a relatively small proportion of households, but it is a culturally important and specialized activity in Utqiaġvik.

Subsistence Resource Abundance

As noted above, the TCH is the primary herd that occurs in the alternatives analysis area, with seasonal migrations occurring through the area during the spring and fall, and large numbers of caribou sometimes occurring in the area during the oestrid fly season (July through August), a peak hunting time for Nuiqsut (Willow MDP Supplemental EIS Section 3.12.1, *Affected Environment*). The alternatives analysis area occurs in areas of relatively low caribou calving density. Impacts to caribou populations could occur through direct mortality (e.g., vehicle strikes) or through decreased calf survival resulting from impacts to calving grounds or to the behavior of maternal caribou. Injuries and mortality resulting from vehicle collisions may occur but are not expected to have population-level effects (Willow MDP Supplemental EIS Section 3.12.2.3.3, *Injury or Mortality*). In addition,

while the Project may result in displacement of some calving caribou because the alternatives analysis area is located in low density calving areas for the TCH, displacement would likely not have population-level effects (Willow MDP Supplemental EIS Section 3.12.2.3.2, *Disturbance or Displacement*). Thus, the abundance of caribou available for subsistence use would not be impacted under Alternative B.

The alternatives analysis area does not have a high density of wolves or wolverines, although the area is heavily used by Nuiqsut furbearer hunters who generally cover large areas in pursuit of these resources. While wolf and wolverine would likely be displaced by infrastructure and human activity and some individual mortalities of wolverine may occur, overall population levels are not expected to be affected by the Project (Willow MDP Supplemental EIS Appendix E.12, *Terrestrial Mammals Technical Appendix*). Thus, the abundance of wolf and wolverine available for subsistence use would not be impacted under Alternative B.

While generally not harvested within the alternatives analysis area, other subsistence resources that could experience direct or indirect impacts from the Project include waterfowl and fish. Waterfowl hunting occurs to the north and east of the alternatives analysis area, while fishing of broad whitefish and other fish species occurs downriver from the alternatives analysis area in Fish Creek. Habitat loss and degradation could displace or cause individual mortalities of these resources, but the Project is not expected to cause population-level effects (Willow MDP Supplemental EIS Section 3.10, *Fish*). A large oil spill could have population-level effects but is not expected to occur (Willow MDP Supplemental EIS Sections 3.10, *Fish*, and 3.11, *Birds*).

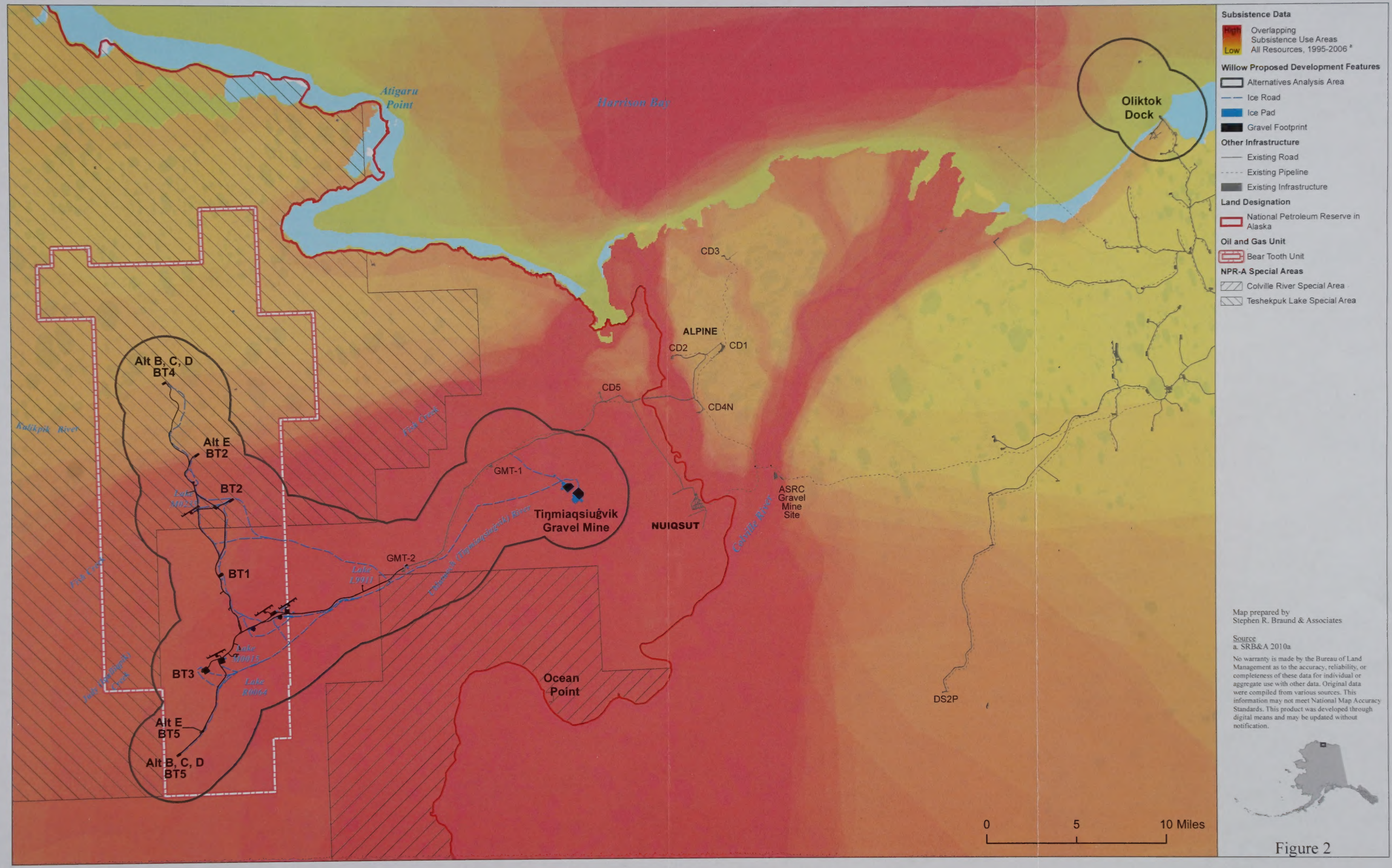
Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Alt E BT2
BT2
BT1
BT3
Alt E BT5
Alt B, C, D BT5
Kuparuk River
Fish Creek
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Ocean Point
DS2P
Lake M0023
Lake L9911
Lake M0015
Lake R0004
Lake Nigliqpaik
0
5
10 Miles
Subsistence Data
High
Low
Overlapping Subsistence Use Areas All Resources, 1995-2006 a
Willow Proposed Development Features
Alternatives Analysis Area
Ice Road
Ice Pad
Gravel Footprint
Other Infrastructure
Existing Road
Existing Pipeline
Existing Infrastructure
Land Designation
National Petroleum Reserve in Alaska
Oil and Gas Unit
Bear Tooth Unit
NPR-A Special Areas
Colville River Special Area
Teshekpuk Lake Special Area
Map prepared by
Stephen R. Braund & Associates
Source
a. SRB&A 2010a
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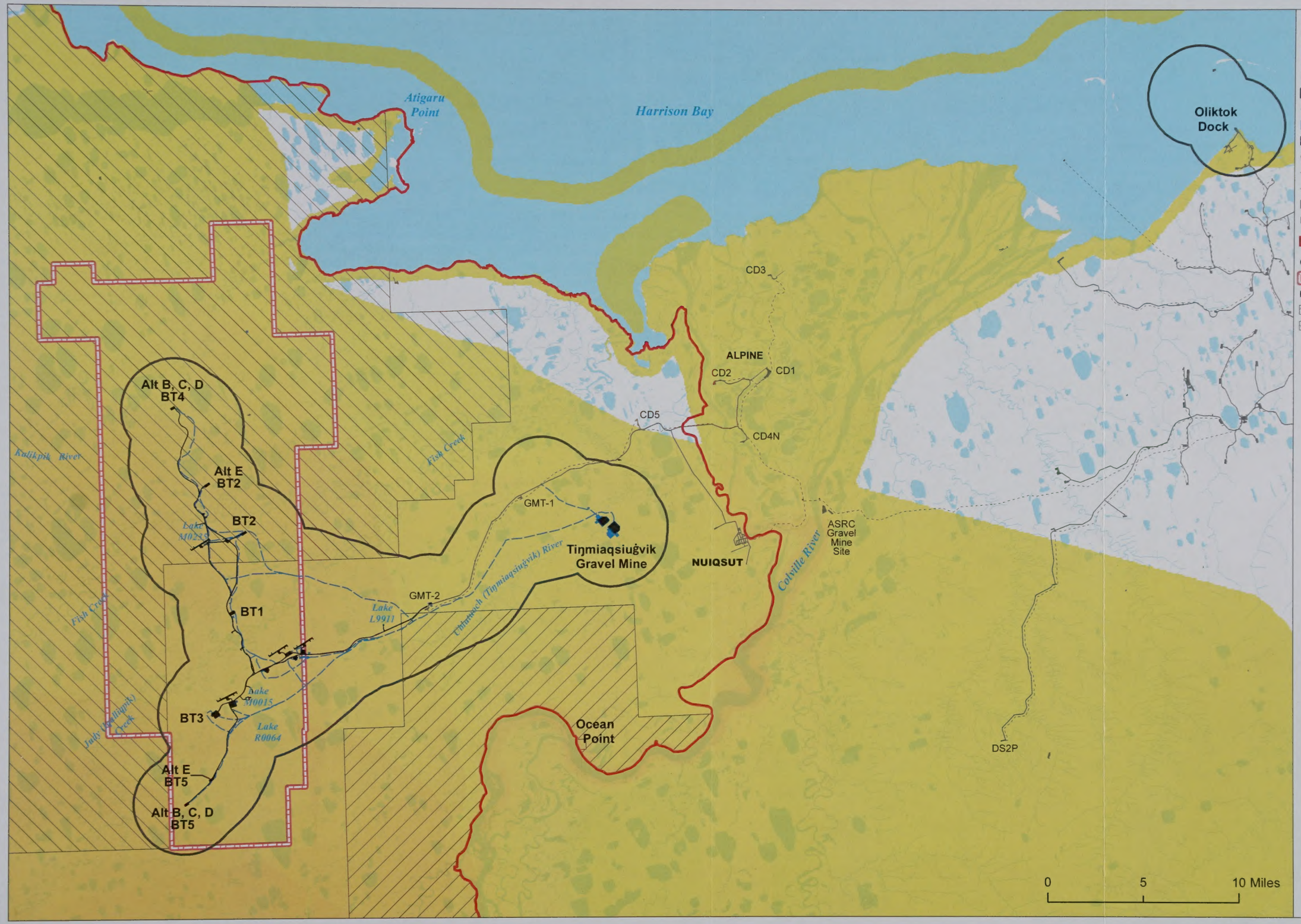
Figure 2

All Resource Subsistence Use Areas, Alternatives Analysis Area, Utqiagvik (Barrow), 1997 to 2006



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas All Resources, 1997-2006 [a]

Willow Proposed Development Features

- Alternatives Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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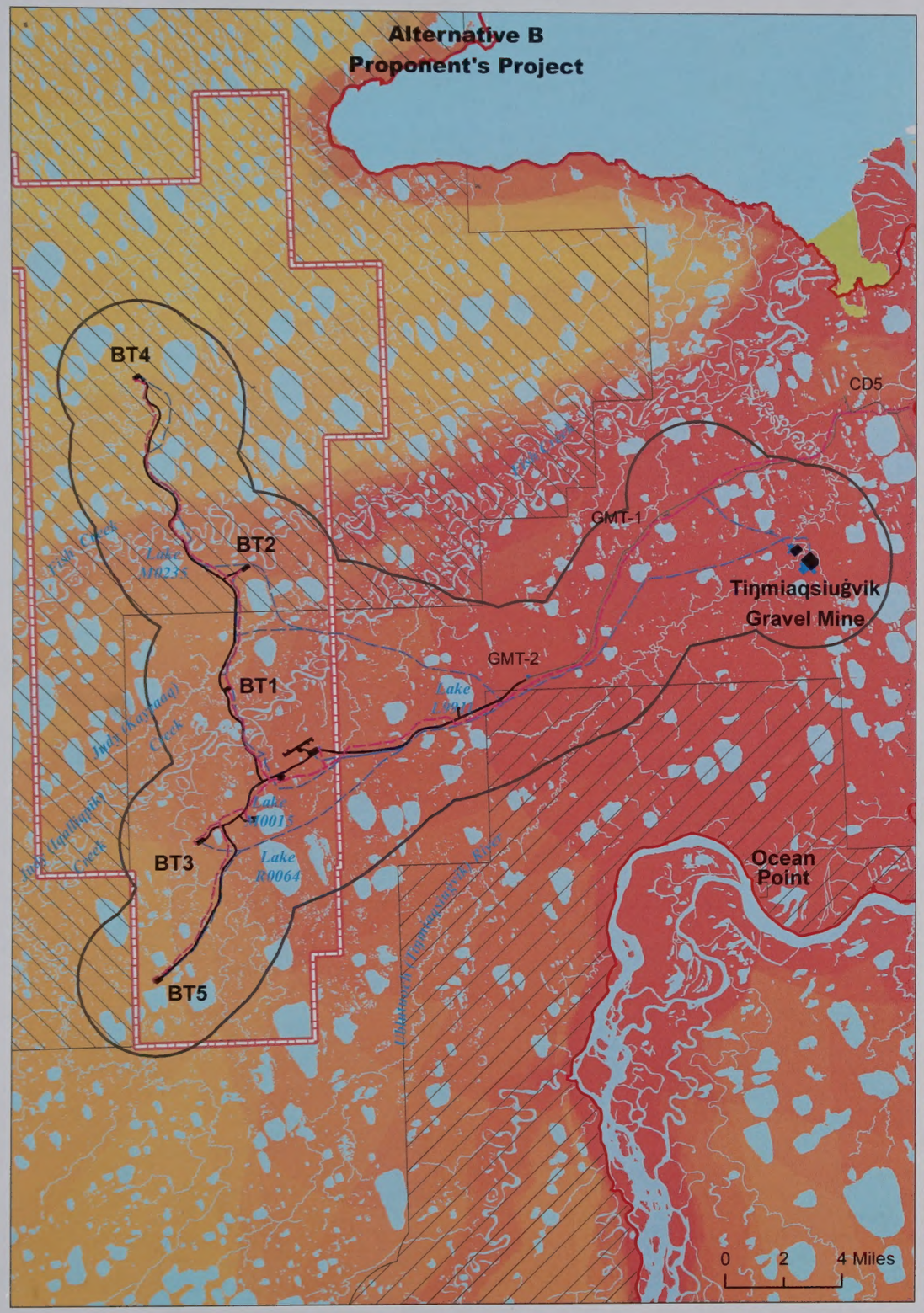
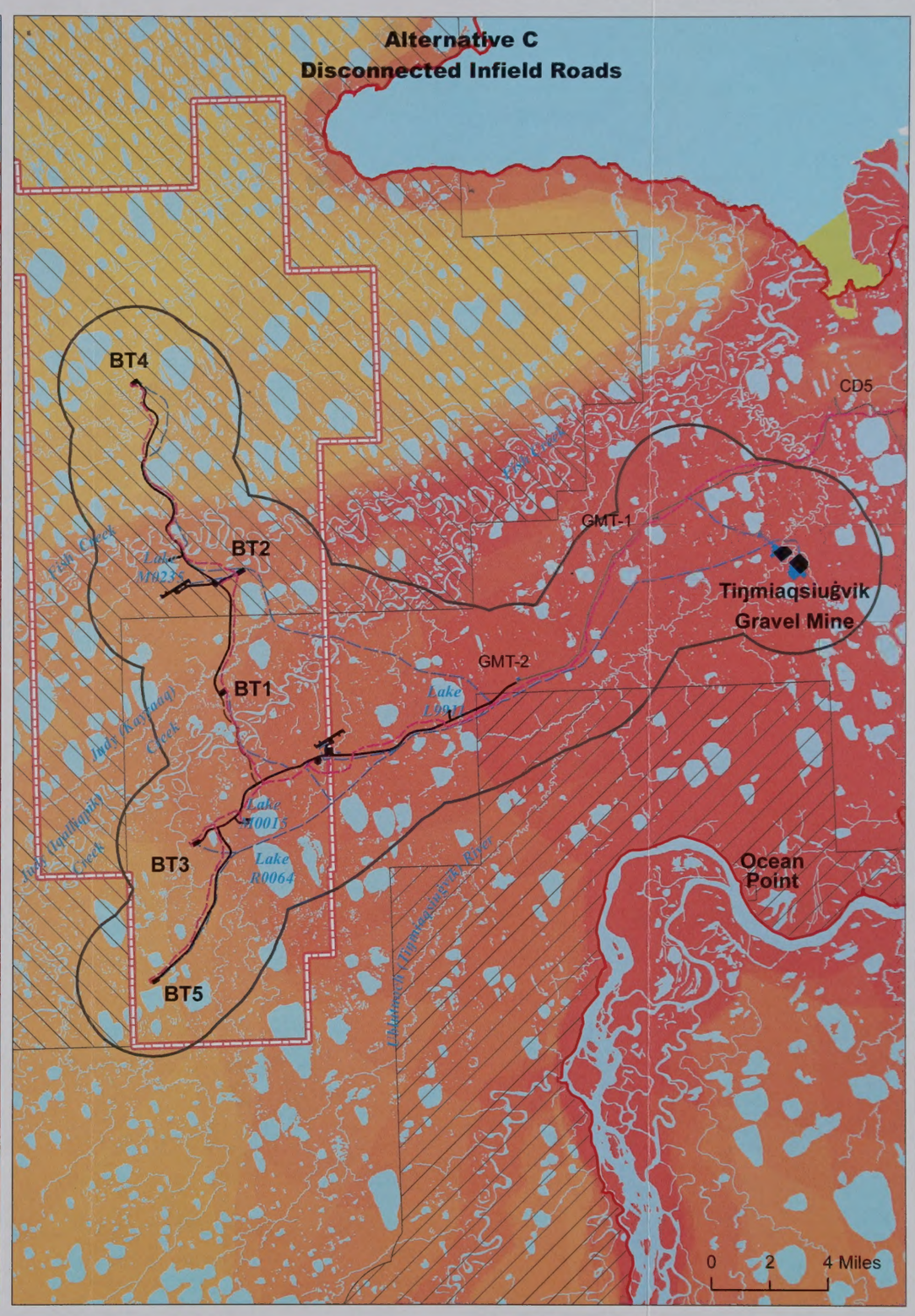
Figure 3





Subsistence Data

- Overlapping Subsistence Use Areas Caribou, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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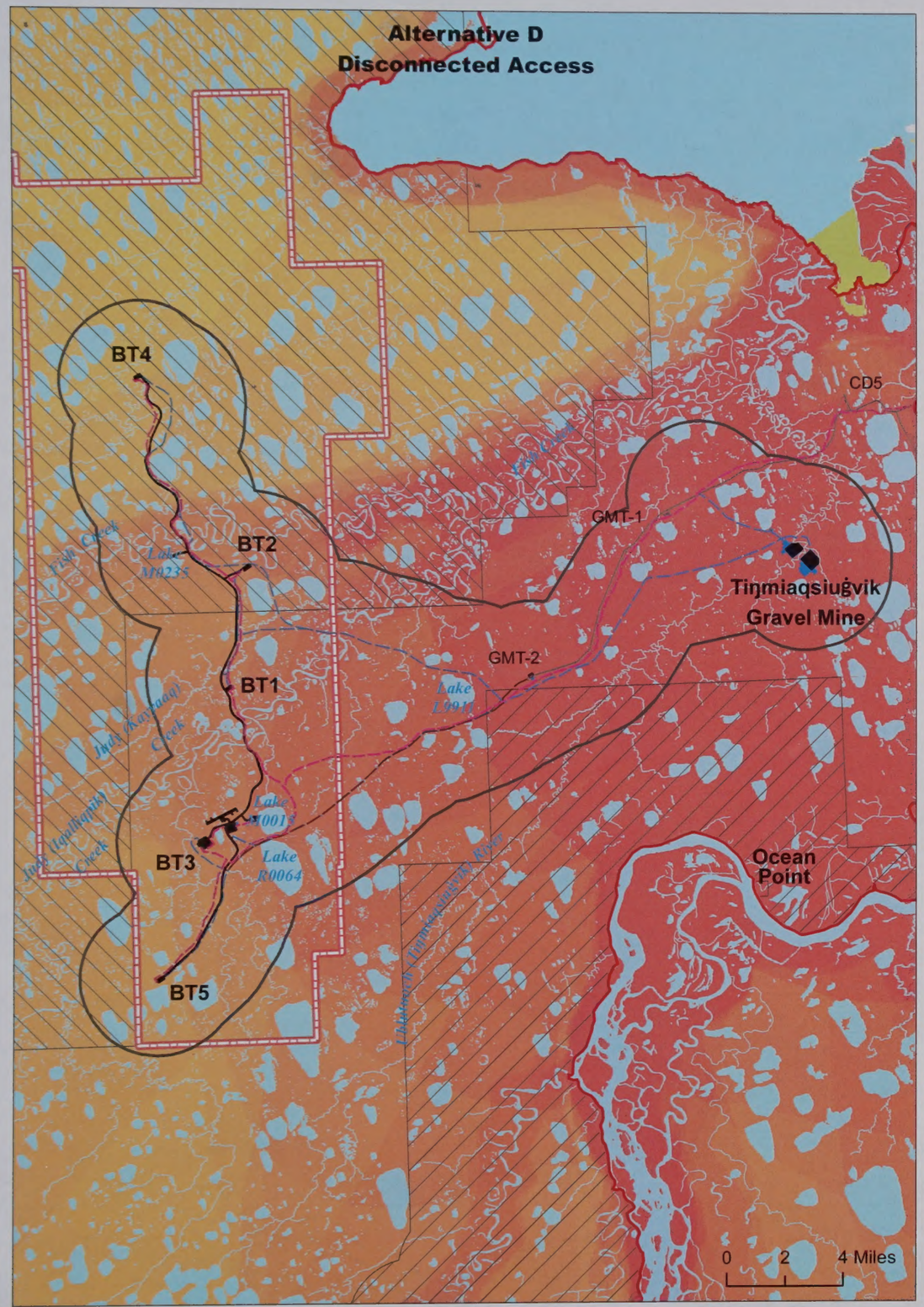
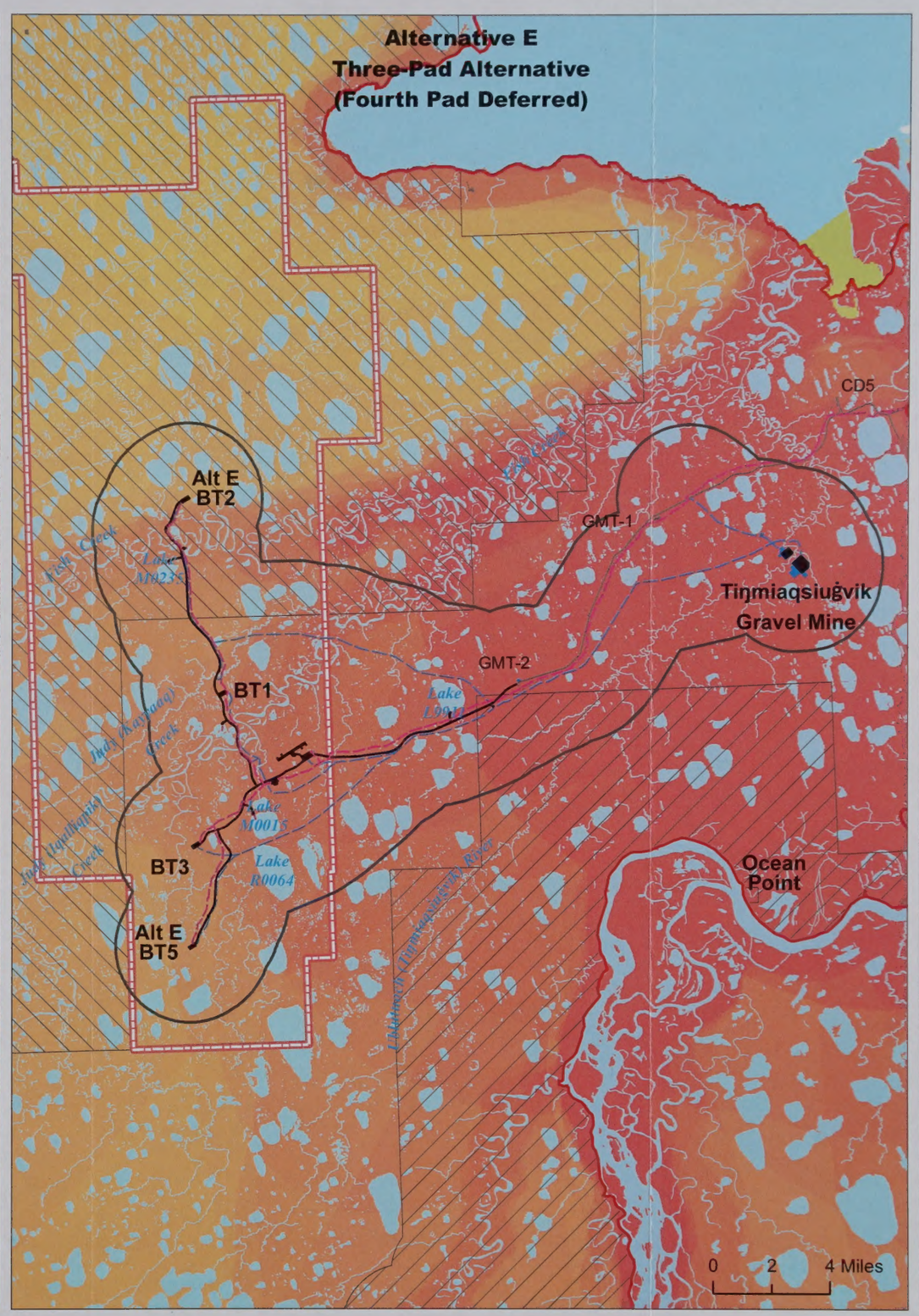
Figure 4





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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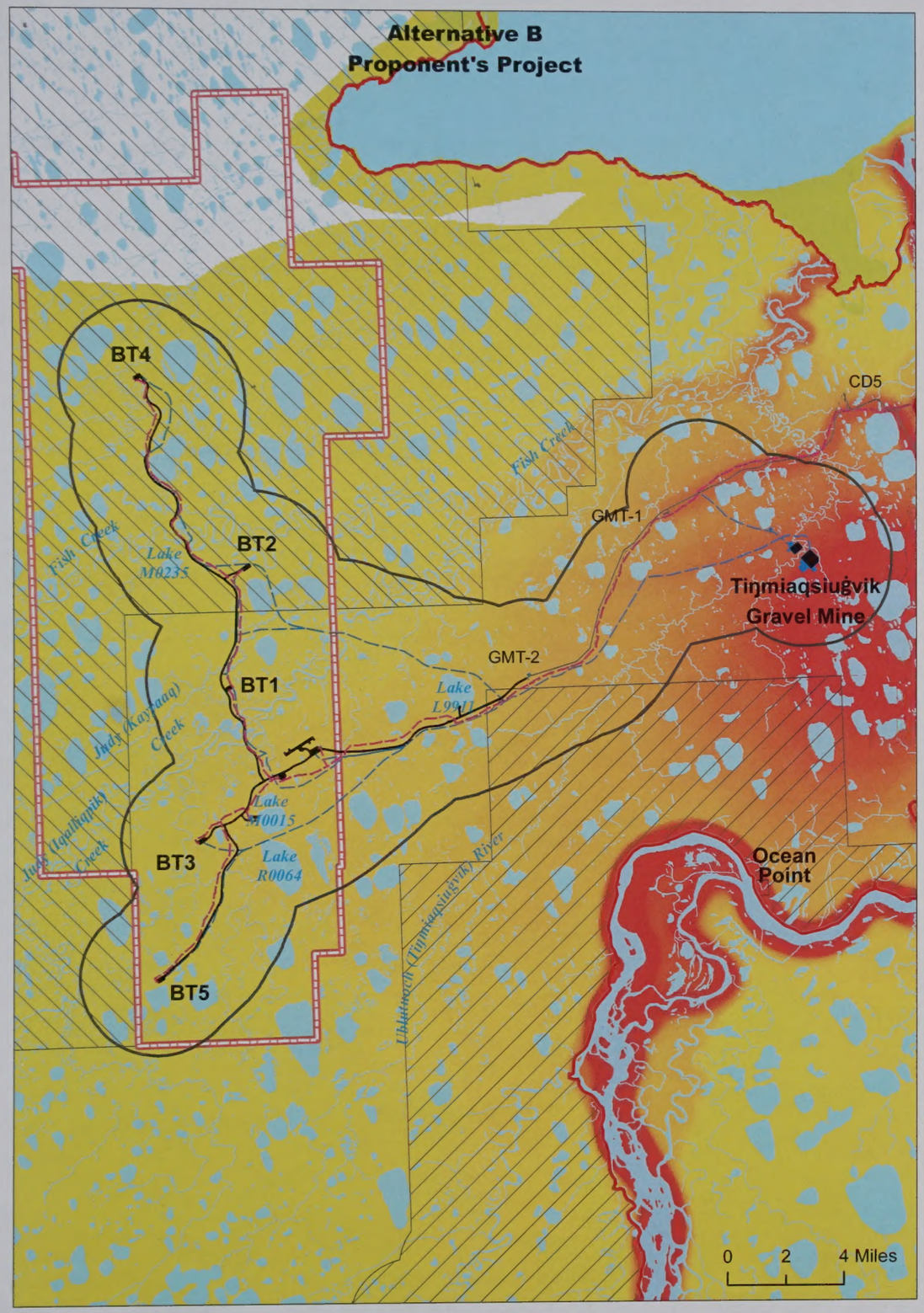
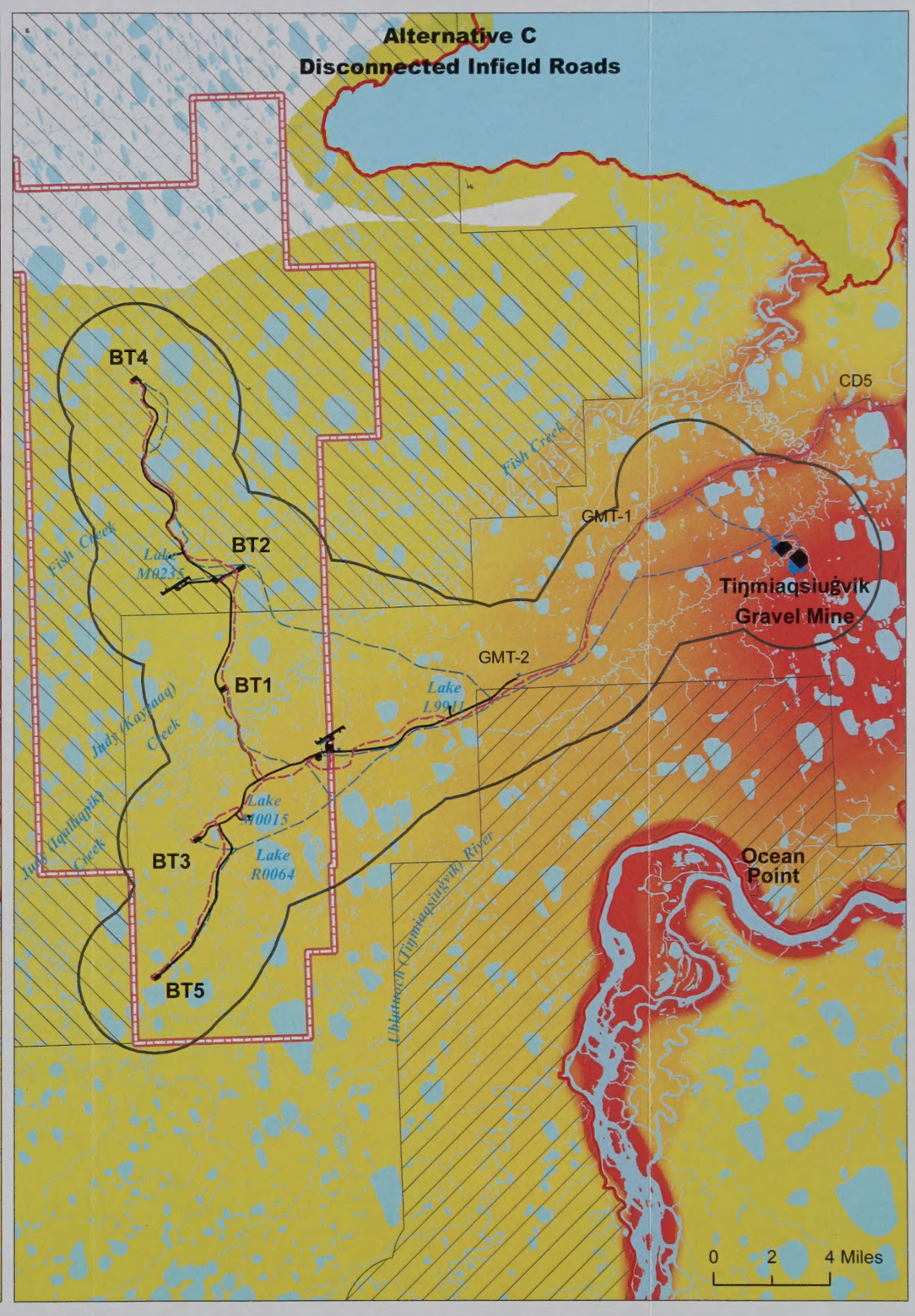
Figure 5





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019*

Willow Proposed Development Features

- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

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NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2021

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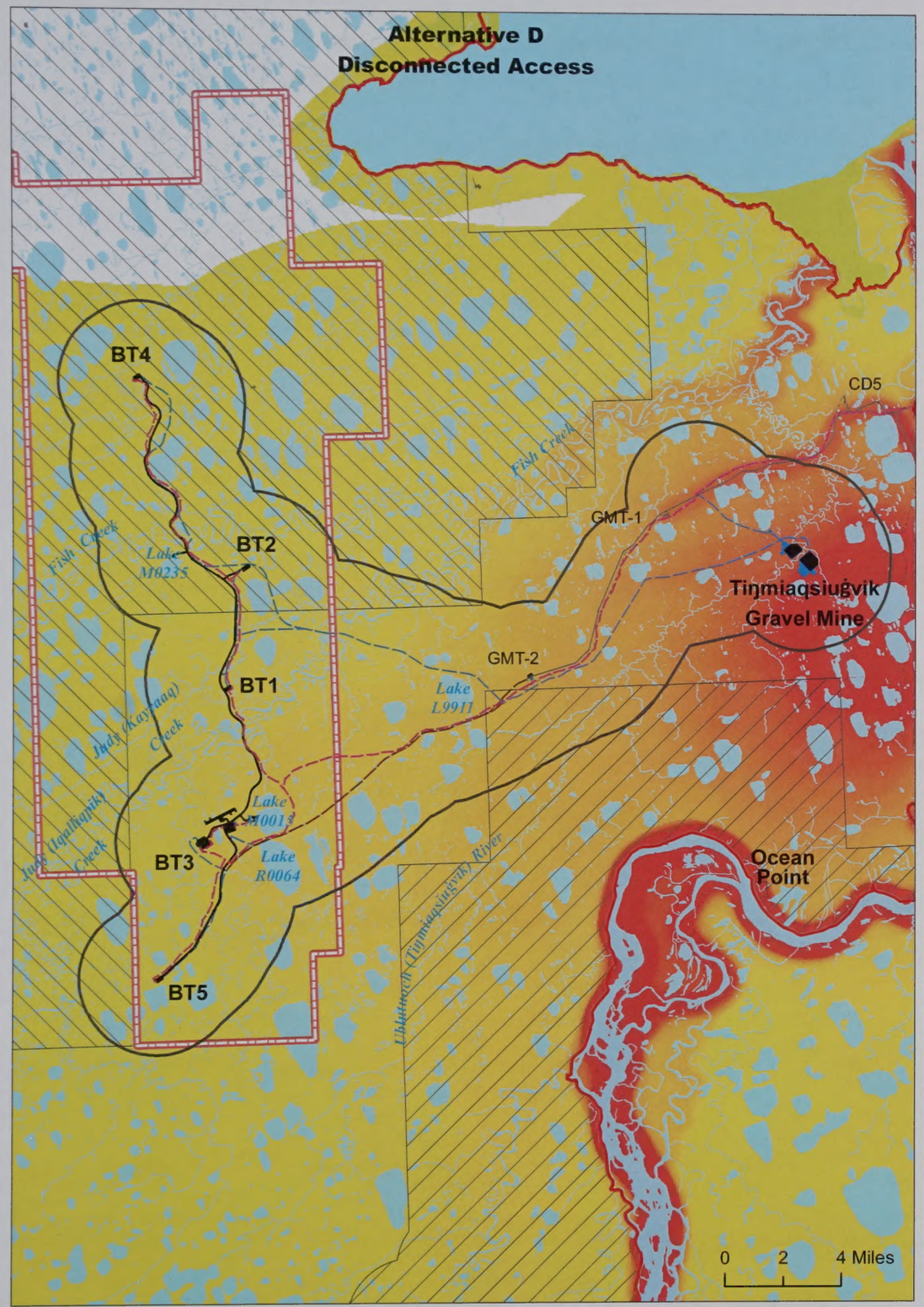
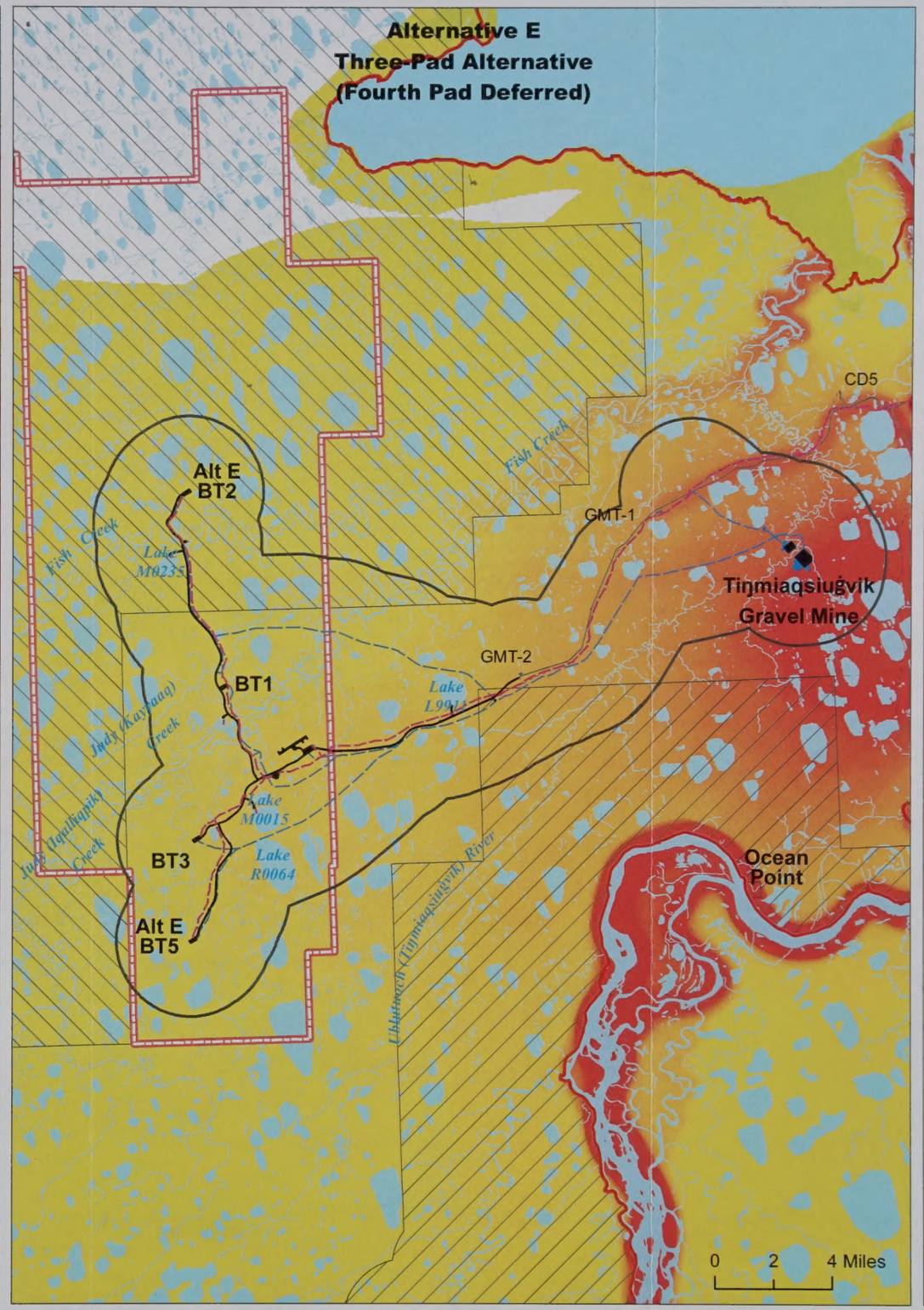
Figure 6





Subsistence Data
- Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019[a] (High / Low)

Willow Proposed Development Features
- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

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NPR-A Special Areas
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* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2021

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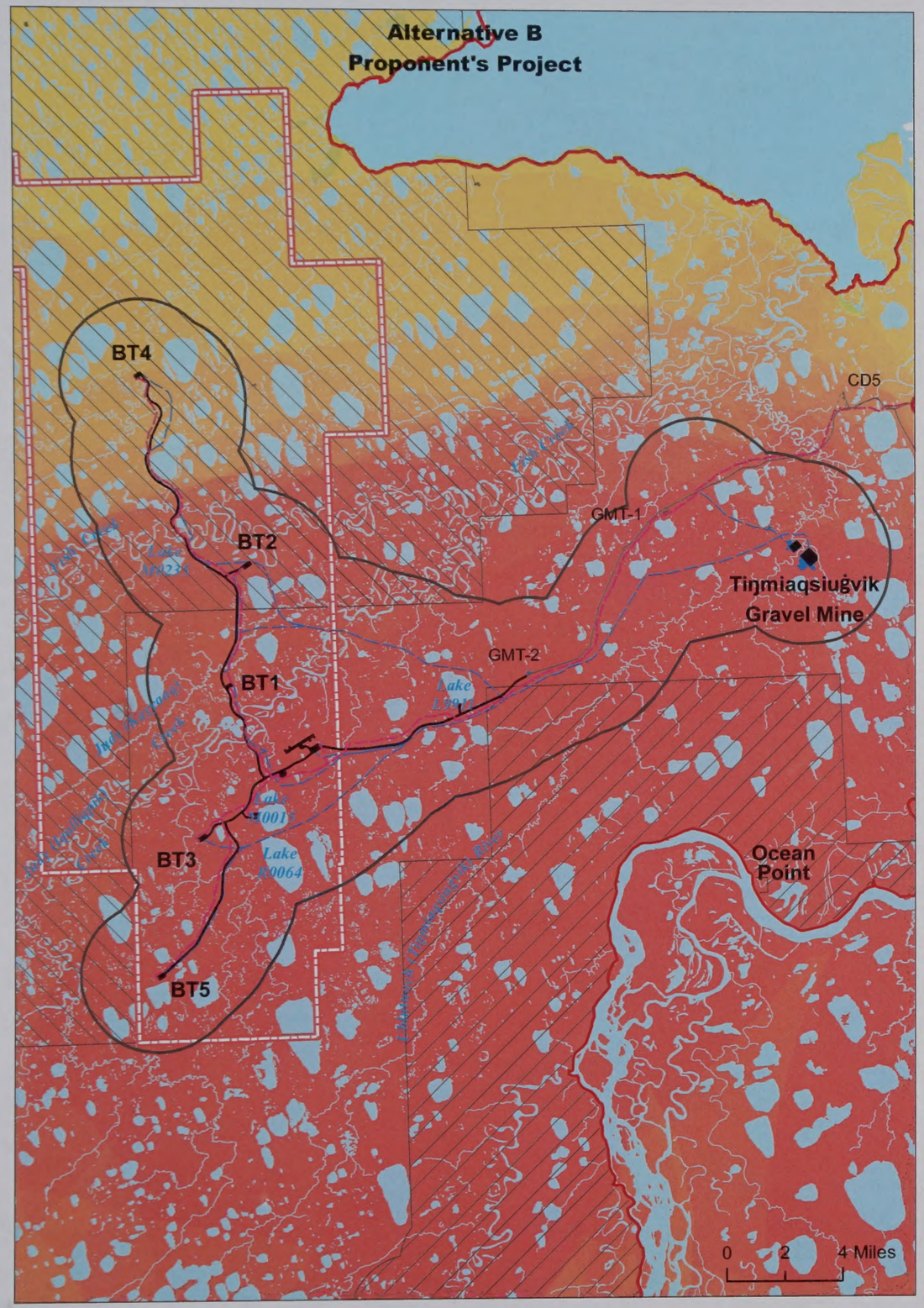
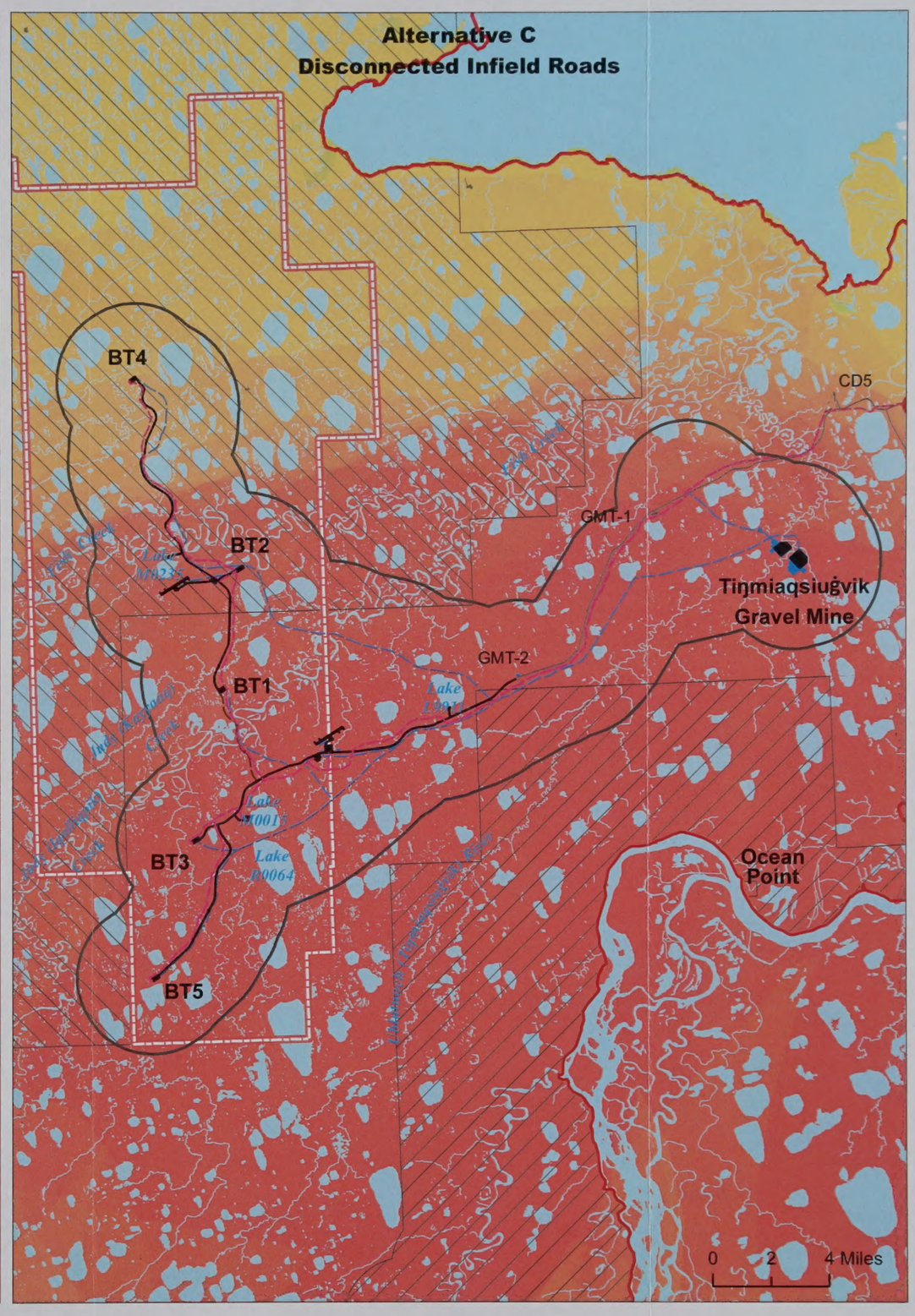
Figure 7





Subsistence Data

- Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

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- Teshekpuk Lake Special Area

* The alternatives analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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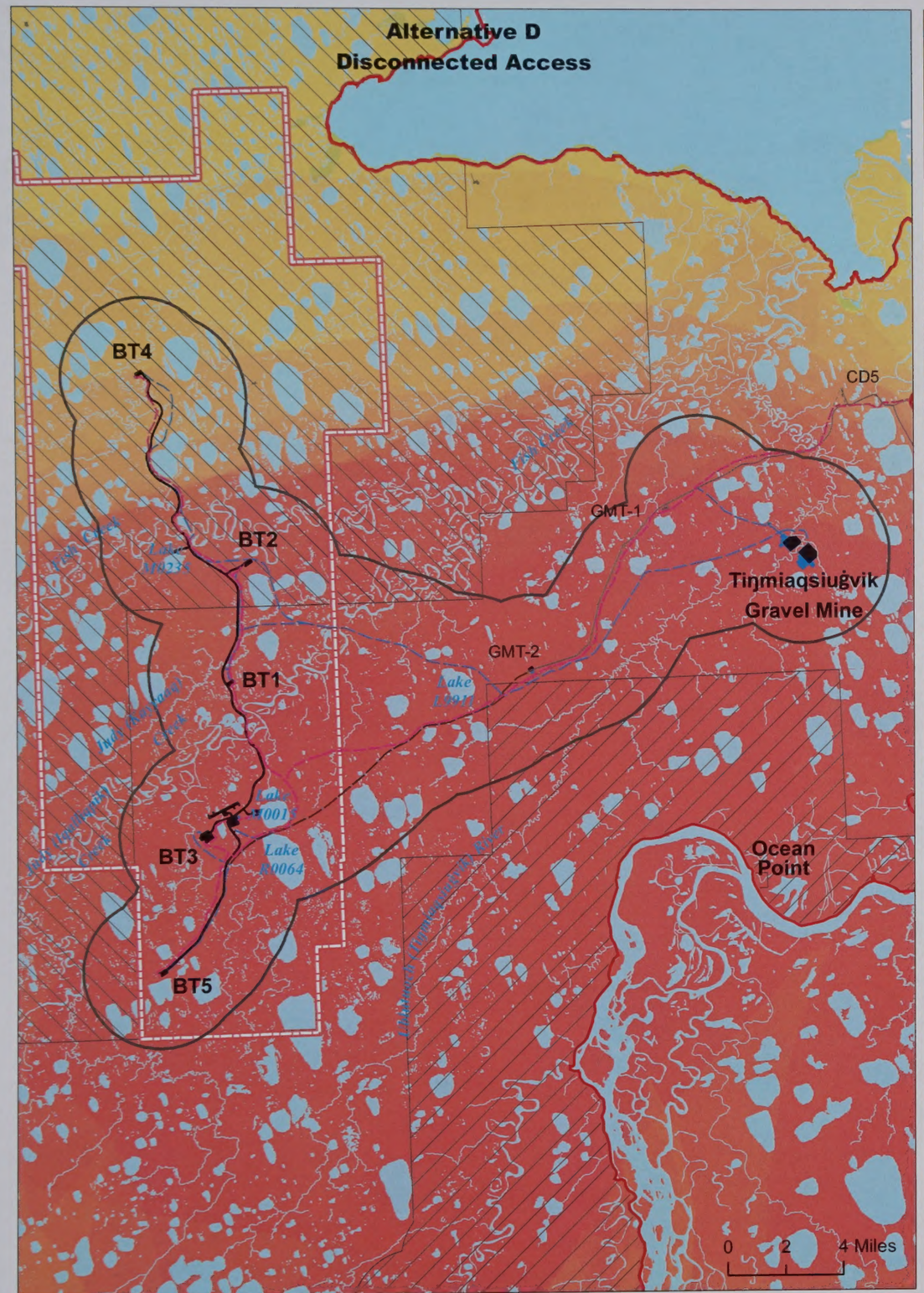
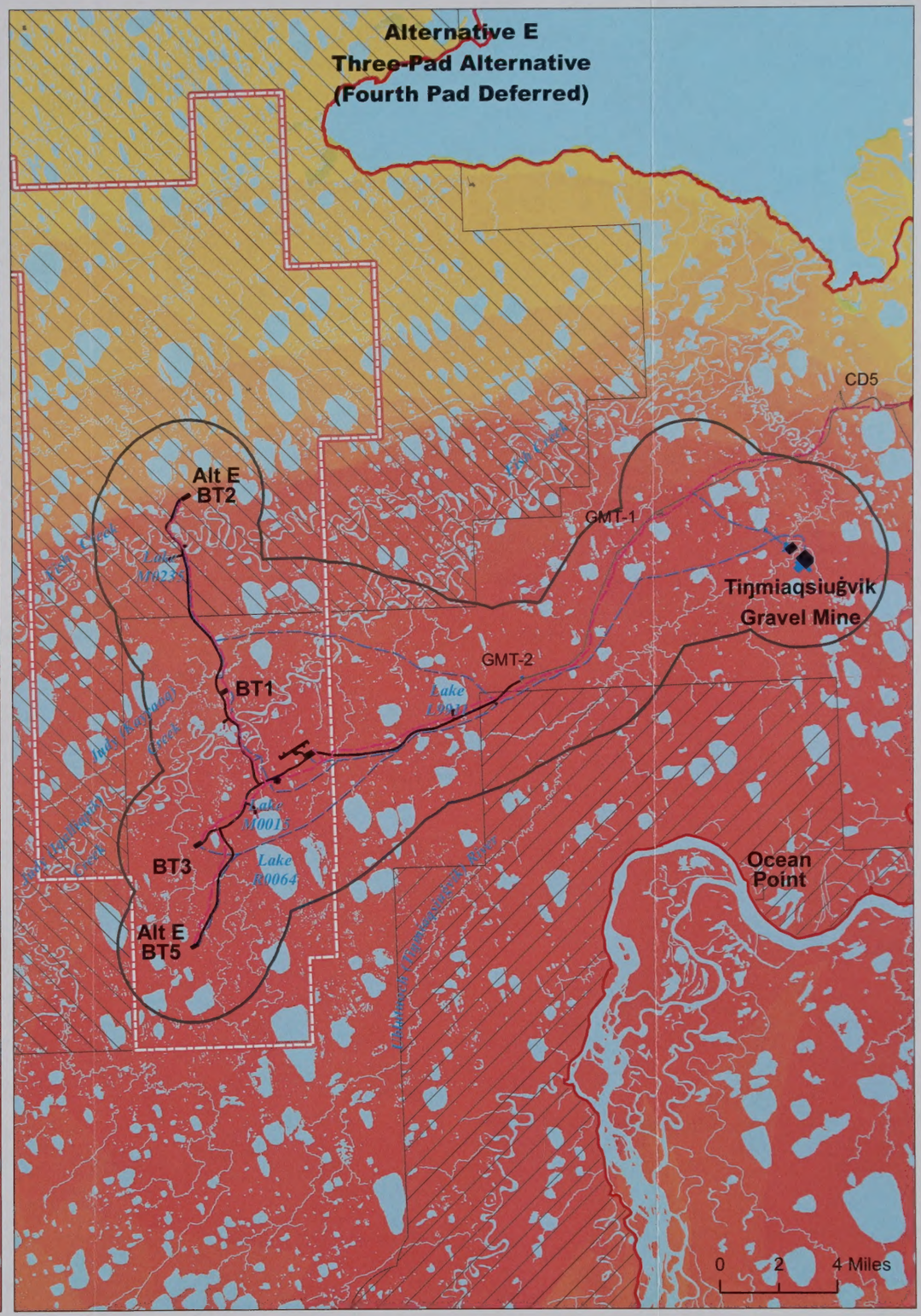
Figure 8





Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 *

Willow Proposed Development Features
- Alternative Analysis Area *
- New Pipeline New VSM
- Ice Road
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- Gravel Footprint

Other Infrastructure
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Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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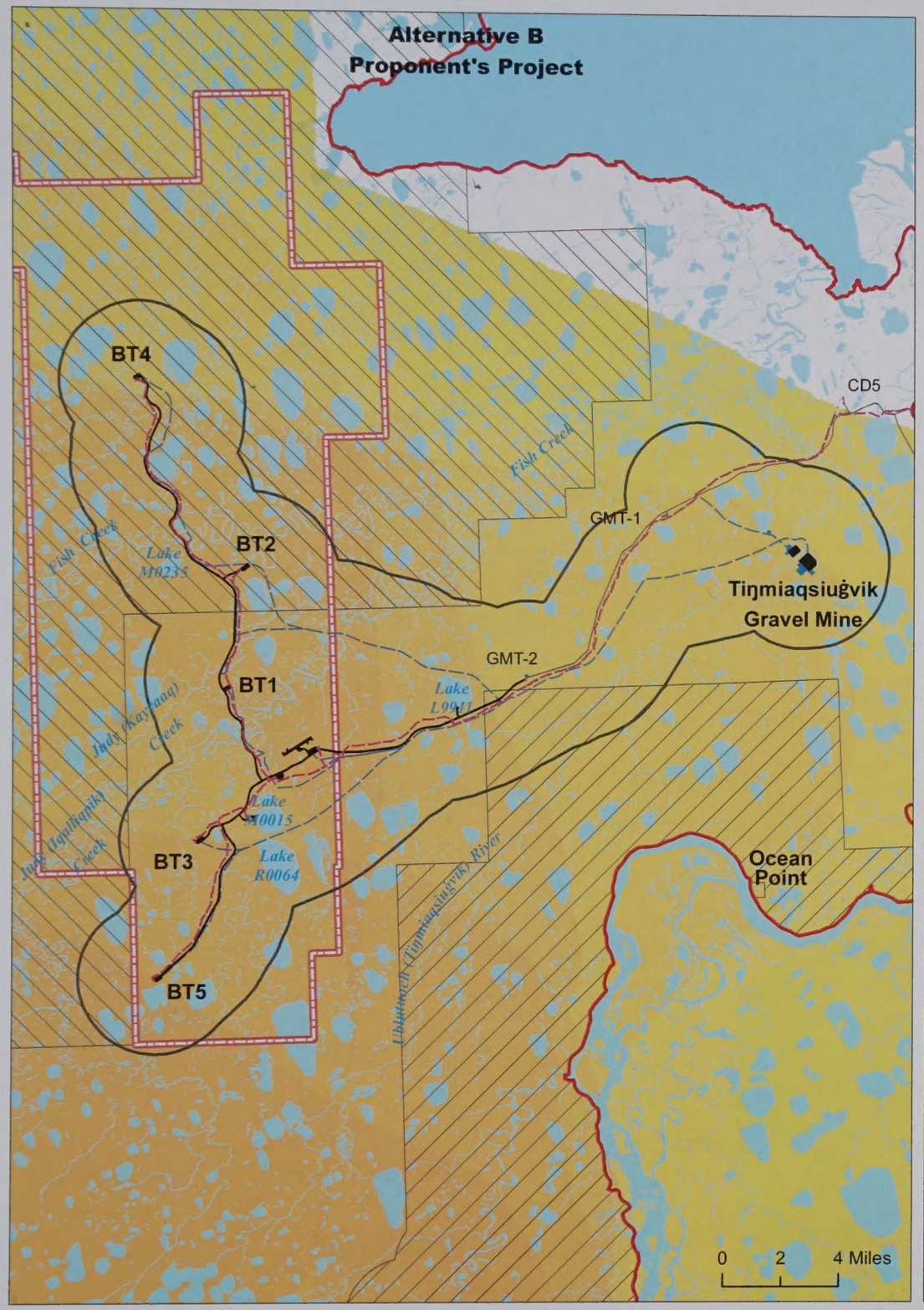
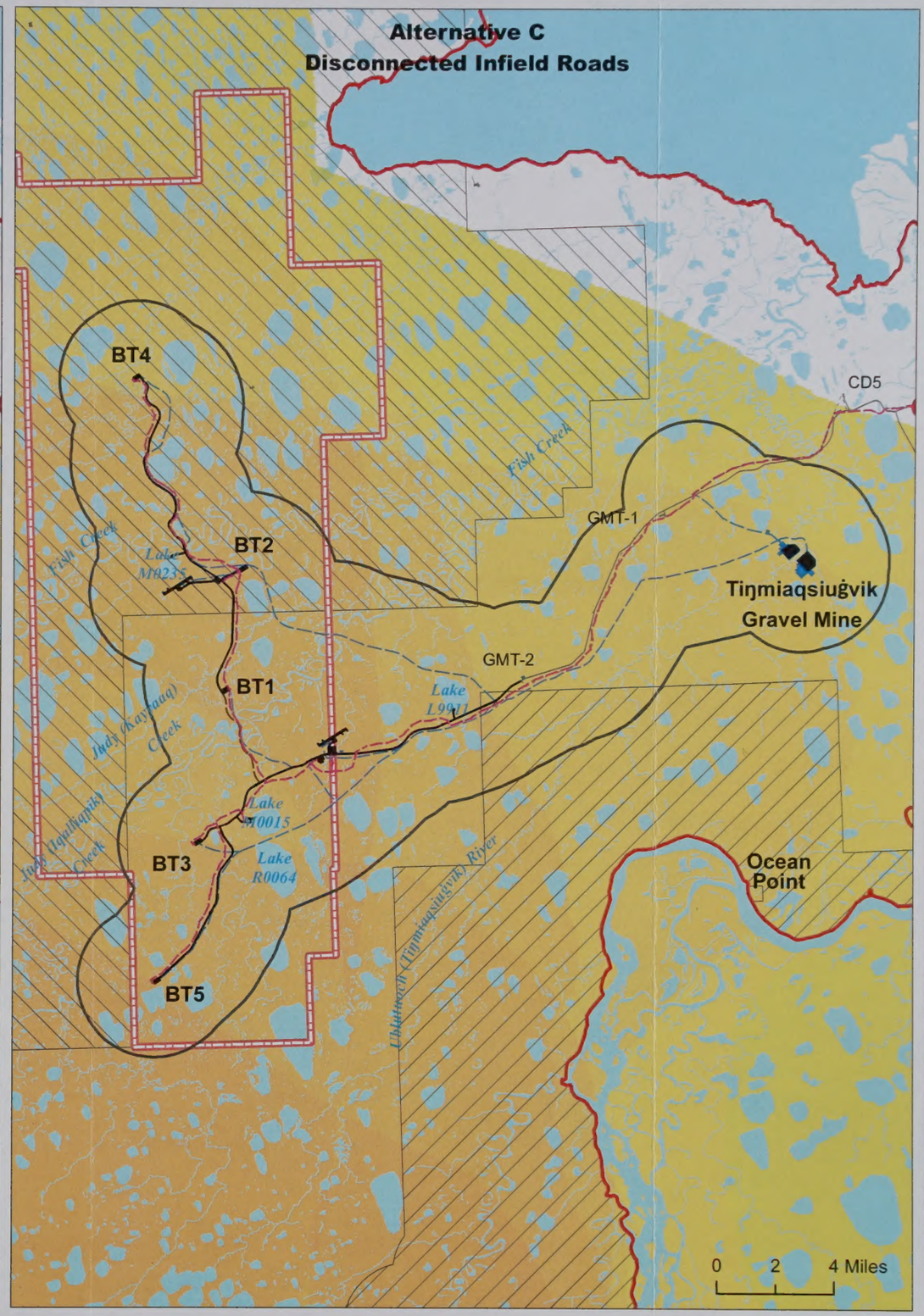
Figure 9





Subsistence Data
- Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006 [a] (High / Low)

Willow Proposed Development Features
- Alternative Analysis Area *
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Map prepared by
Stephen R. Braund & Associates

Source
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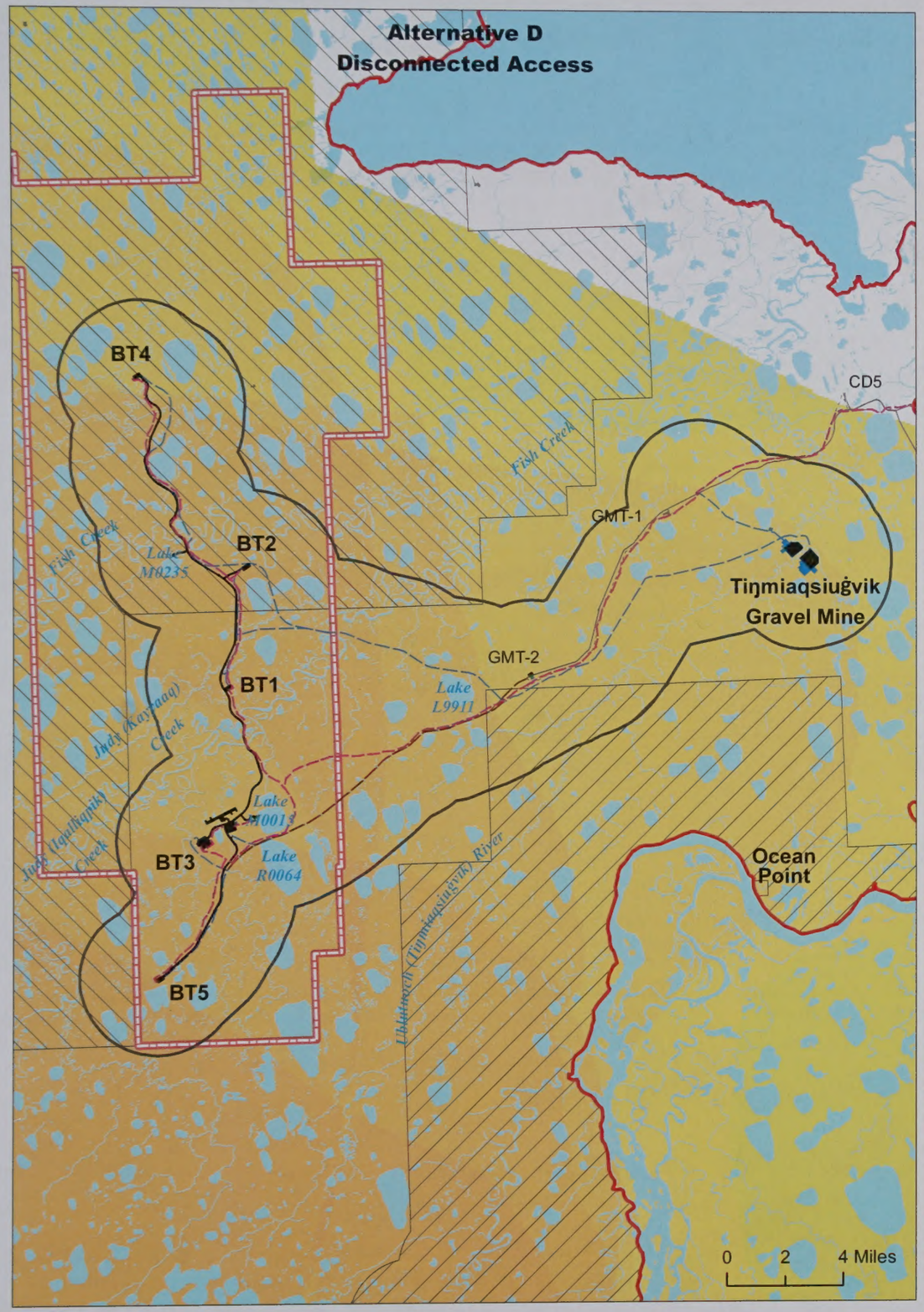
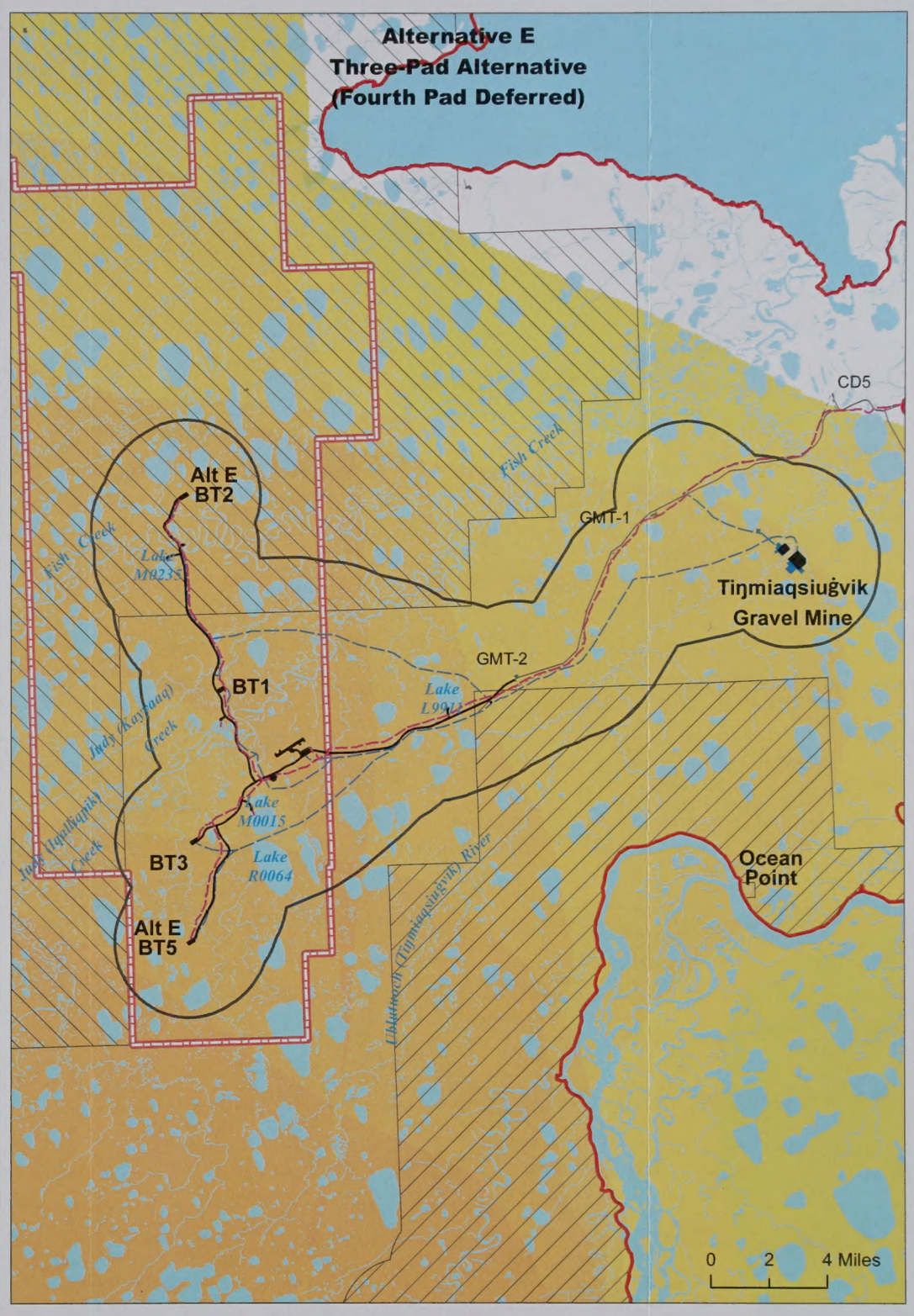
Figure 10





Subsistence Data
- Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006[a] (High / Low)

Willow Proposed Development Features
- Alternative Analysis Area *
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Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

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Map prepared by
Stephen R. Braund & Associates

Source
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Figure 11

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment*, and in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. Nuiqsut caribou hunting primarily occurs along the Colville River drainage, including the Niġliq and East channels, as well as in overland areas to the west, southwest, and northwest of the community. While boat is the primary method of travel to caribou hunting areas along the Colville River, overland areas west of the community are primarily accessed by ATV, snow machine, and, since construction of the Kuukpik Spur, CD5, GMT-1, and GMT-2 roads, by automobile. Use of the area west of Nuiqsut for caribou hunting has increased somewhat in recent years, partially due to increased access from recently constructed gravel roads. The increase in subsistence use to the west of the community correlates with decreased use of other areas including Niġliq Channel, East Channel, and the Fish Creek drainage, which have been commonly reported as places of avoidance by local hunters due to development, environmental, and personal factors (SRB&A 2019a). Nuiqsut caribou hunting activities in the direct effects analysis area peak from July through September, as does hunting directly east and south of the alternatives analysis area (Willow MDP Supplemental EIS Appendix E.16). The majority of the use of the alternatives analysis area for caribou hunting occurs in the eastern portion of the area surrounding the proposed gravel mine and access road. Recent data from the Nuiqsut Caribou Subsistence Monitoring Project (2017–2019) have shown increasing overlapping use to the west along the GMT-1 and GMT-2 roads (SRB&A 2021). Data for the 1995 through 2006 time period shows greater use of the alternatives analysis area; recent years have seen a decrease in use of snow machines and increased use of ATVs, which may partly explain the relatively smaller overland use areas shown on Figures 6 and 7 compared to Figures 4 and 5 (SRB&A 2021). During years with adequate snow cover, use of the area may be higher. Nuiqsut caribou hunters often target caribou in the area west of the community while caribou are most available in the area during the oestrid fly season (July and August) and fall migration (August and September). During these time periods, caribou may cross through the Project and alternatives analysis area before being hunted to the west of the community. In recent years, residents have reported using roads to access caribou during these times because the caribou tend to stay near the road system rather than migrating farther south and east as they have in the past. Such deflection near the road was documented by Welch, Prichard et al. (2021) during the 2020 summer and fall migration.

Nuiqsut wolf and wolverine hunting is a winter subsistence activity that occurs in large overland areas to the west, south, and southeast of the community. For the 1995 through 2006 time period, 88% of wolverine harvesters and 87% of wolf harvesters reported using the alternatives analysis area. The majority of the alternatives analysis area is used heavily for wolf and wolverine hunting by Nuiqsut harvesters. Wolf and wolverine hunting in the area peaks from November through March and occurs by snow machine (Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*).

Potential impacts to the abundance of subsistence resources are discussed above. The primary sources of potential impacts to resource availability of caribou, wolf, and wolverine to subsistence users include:

1. Displacement resulting from habitat loss (roads, pipelines, and/or other oil and gas facilities).
2. Displacement resulting from road disturbance.
3. Displacement from air traffic.
4. Displacement from other infrastructure and sources of disturbance.

These impacts are discussed in further detail below.

Displacement of Caribou Due to Habitat Loss

Impacts on caribou related to habitat loss are discussed in Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*. The Project area is to the east and south of the TCH primary calving grounds which, in recent years, occur with the greatest density to the southeast of Teshekpuk Lake. Alternative B would remove 615.6 acres of terrestrial mammal habitat due to gravel mining and construction of gravel infrastructure. Additional habitat loss or alteration would result from gravel spray and dust deposition. The habitats that would be affected by Alternative B are not unique, and similar habitats would be available nearby. Thus, habitat loss and alteration associated with the Project would likely cause caribou to move to similar habitats nearby and would not have overall impacts on subsistence resource availability for Nuiqsut harvesters.

Displacement of Caribou Due to Road Disturbance*

Impacts on caribou and caribou hunting resulting from road-related disturbance are discussed in Willow MDP Supplemental EIS Sections 3.16.2.3.2.1, *Resource Availability–Caribou*, and 3.12.2.3.2, *Disturbance or Displacement*. The increasing presence of roads near Nuiqsut has resulted in increased reports of impacts to hunting from roads and road traffic (SRB&A 2016, 2017a, 2018a, 2019a; SRB&A 2020a, 2021). As noted above, the Project area would be in the northeastern portion of the range of the TCH. In the spring (May and June), some TCH caribou migrate through the Project area on their way to calving grounds, with males arriving in mid- to late-June when Nuiqsut residents begin traveling by boat to hunt caribou. In the summer oestrid fly season (July and August), caribou sometimes occur in the area of proposed infrastructure in large numbers, and in the fall, large numbers of caribou may move through the Project area as they migrate south to their wintering grounds (Prichard, Macander et al. 2018).

The Alternative B Project access road would bisect a portion of the fall migration corridor and would occur in areas heavily used by TCH caribou in some years (during both the summer and winter months). Residents hunt to the west, northwest, and southwest of the community of Nuiqsut during the summer and fall by ATV, and they hunt to the north and west of the community by automobile. In addition, residents hunt caribou by boat along the Colville River to the east and southeast of the proposed road corridor in the months of July, August, and September (Willow MDP Supplemental EIS Appendix E.16). While the majority of this hunting occurs in the eastern portion of the alternatives analysis area near the proposed mine site and directly east of the proposed road, some residents also travel as far as the proposed gravel road, particularly when using the existing road system to access hunting areas. This has become increasingly common in recent years with construction of the GMT-1 and GMT-2 roads (SRB&A 2021). The most heavily used hunting areas are directly east and northeast of the proposed access road. Some caribou may remain in the Project area throughout the winter and are hunted by individuals on snow machine or, in recent years, along the road. While the number of caribou that occur within the alternatives analysis area may represent a small portion of the overall herd, they represent an important source of caribou available to the community of Nuiqsut, and harvests within the area may be increasing (Willow MDP Supplemental EIS Section 3.16.2.3.2.1). Thus, roads associated with the Project have a high potential for disturbance of caribou and Nuiqsut caribou hunting activities. While some Utqiaġvik hunters may venture into the western portion of the alternatives analysis area in some years during winter, the area is not a primary hunting area for caribou for that community. Thus, this discussion focuses on potential impacts to Nuiqsut hunters resulting from road disturbance.

Roads and road traffic are believed to cause behavioral and migratory changes in caribou that can affect hunting success. Deflections or delays of caribou movement from roads and associated ground traffic and human activity have been documented both by active harvesters (SRB&A 2010a, 2011, 2012, 2013b, 2014, 2015, 2016, 2017a, 2018a; SRB&A 2019b, 2020b, 2021) and during behavioral studies on caribou (Welch, Prichard et al. 2021; Wilson, Parrett et al. 2016). During the Nuiqsut Caribou Subsistence Monitoring Program, reports of road-related impacts on caribou hunting have steadily increased since road construction began. Year 9 (2016) of the study was the first year where impacts related to man-made structures (e.g., roads, pipelines) were as common as impacts related to helicopter traffic (SRB&A 2018a). In Year 10 (2017) and Year 11 (2018), when constructed roads included the Spur, CD5, and GMT-1 roads, impacts from human-made structures were the most commonly reported impacts (SRB&A 2019a). In 2019, reports of direct impacts related to human-made structures decreased somewhat, although residents continue to discuss indirect impacts associated with resource availability. Residents indicate that the roads pose both a physical and visual barrier to the caribou and have observed changes in caribou distribution and behavior around roads, including decreased availability of caribou closer to the community (SRB&A 2019a). Residents also note that safety considerations around roads reduce the availability of individual caribou as residents are careful not to shoot toward infrastructure.

Avoidance of roads is particularly common for maternal caribou (displacement of between 0.6 and 3.1 miles [1 and 5 kilometers] from roads) (Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*). Displacement of calving caribou would likely not have direct effects on hunter success, as hunting during the spring calving season is low and the hunting that does occur focuses on males. During the mosquito and oestrid fly seasons, caribou are highly mobile due to insect harassment and regularly approach and cross pipelines; however, deflected movements and delays become common where roads and pipelines are close to one another or where traffic rates exceed 15 vehicles per hour (Willow MDP Supplemental EIS Section 3.12). Deflections or delays of several hours could have substantial impacts to harvesting success for residents hunting to the east of the road corridor, particularly hunters waiting along river corridors with no means of approaching delayed herds.

Traffic rates of over 15 vehicles per hour would be more common during construction, and therefore decreased hunting success resulting from delayed caribou crossings would be more frequent during the construction period. It is likely that caribou deflections would continue during operations but at a lower intensity and frequency than during Project construction. In addition to increased road traffic along Project roads, development of the Project would also increase road traffic along existing roads connecting the Project area to Greater Mooses Tooth (GMT) and Alpine developments. Thus, impacts related to roads would extend beyond the alternatives analysis area.

Caribou tend to follow linear infrastructure when they are placed parallel to the herd's primary movement (Willow MDP Supplemental EIS Section 3.12), though perpendicular roads can also intercept caribou and cause delayed crossing (BLM 2018; CPAI 2018). The Alternative B access road, where it intersects with infield roads near the WPF, WOC, and airstrip, could create a "pinch point" and deflect caribou away from the road during the fall migration. During the 2020 summer/fall caribou migration, caribou were delayed crossing the GMT-1 and GMT-2 roads and instead traveled parallel to the road system until they had passed all infrastructure (Welch, Prichard et al. 2021). Under Alternative B, these caribou would have to cross over one or more roads in order to continue their migration east and south and therefore delays may have been longer, possibly resulting in the herd not migrating into the area west of Nuiqsut, where residents frequently hunt them during the fall months. An overall deflection of migration could have substantial impacts to residents hunting caribou in overland areas during the fall. While residents hunting along roads would likely experience greater hunting success in these circumstances, some hunters will likely continue to prefer hunting in traditional overland areas rather than accessing them by road. In addition, if roads cause deflection rather than simply delaying caribou movement, there could be an overall reduction in success among road and overland caribou hunters. Temporary changes in distribution have not been shown to alter overall migration patterns or herd distribution (Willow MDP Supplemental EIS Section 3.12); however, small changes in caribou distribution and movement from a biological perspective can have large impacts on hunter success as residents are generally limited in how far and fast they can travel, particularly during the snow-free season. Because Nuiqsut is on the periphery of the two caribou herds which they rely upon (Prichard, Macander et al. 2018), they are particularly vulnerable to small changes in overall herd distribution or migration.

Caribou responses to roads seem to vary from year to year based on the context in which roads are encountered; thus, while Project roads may not deflect caribou during all seasons or years, in some years, deflections or delays could take place (Willow MDP Supplemental EIS Section 3.12). The likelihood of deflections would be higher during construction, when traffic levels would regularly exceed 15 vehicles per hour. Based on available data, it is not possible to predict the exact frequency or intensity at which deflections would take place. However, it is reasonable to conclude that caribou would be deflected from Project roads in some years, resource availability would be affected as a result of such deflections, and subsistence hunters may experience decreased hunting success during those times. Project roads would be built under CPAI's new Insulation Implementation Plan (see Appendix D.1, *Alternatives Development*). Under this plan, CPAI would use insulated embankments along approximately 18 miles of the 22 total miles of gravel road length. The insulated embankments would help reduce impacts to caribou availability by reducing the height and visual barriers of the gravel roads and pads, and by reducing gravel mining requirements (thus reducing associated noise and traffic impacts). Nuiqsut harvesters have reported difficulties spotting for caribou in certain areas where terrain conditions and road height result in blocking long-distance views. In addition, residents have reported difficulties crossing over roads in certain areas with steep embankments. The insulated embankments would lower the overall height of the roads, thus reducing these incidences.

According to CPAI (2018), the TCH may be less habituated to development activity than the CAH due to the relative lack of infrastructure within its range. Thus, TCH caribou may be more prone to disturbance than the CAH (Willow MDP Supplemental EIS Section 3.12). Impacts on resource availability would most likely occur during the summer and fall months when caribou hunting activity in overland areas and along the Colville River is highest (Table E.16.7 in the Supplemental EIS Appendix E.16). During the oestrid fly season, groups of caribou could gather on gravel pads and gravel roads for insect relief; which may result in increased availability of caribou for individuals hunting along roads but may also increase the likelihood of vehicle strikes and mortalities. Individuals not using roads to access caribou may experience reduced success closer to Nuiqsut, as the caribou are delayed or deflected from crossing roads toward the community's primary hunting area west of the community or along the Colville River toward Ocean Point. Increased hunting along the road corridor could also reduce the availability of caribou for hunters along river corridors or to the east of the road corridor and create increased competition among hunters if road use becomes more common.

Overall caribou harvests for the community of Nuiqsut as a whole have remained stable over time (during study years spanning the 1980s through 2019) (SRB&A 2021). Residents have reported that access to roads has offset some of the impacts of increased infrastructure and activity on resource availability by providing hunting access to areas farther from the community, although some report avoiding the roads altogether. Use of roads, and use of trucks to hunt for caribou, increased substantially after the Kuukpik Spur Road was built. While the first few years of road use did not show an increase in harvests along the road system, in 2018 and 2019, the percentage of caribou harvested within 2.5 miles of new infrastructure increased by approximately 10 percentage points from previous years. This suggests that the increasing use of roads has translated to increased harvests in the area west of Nuiqsut (SRB&A 2021).These conclusions are based on 6 years of post–road construction data, and hunting patterns will likely continue to change and adapt to the increasing presence of roads. Consequently, it is difficult to draw conclusions at this time regarding the magnitude of impacts of the CD5, GMT-1, and GMT-2 roads based on existing data. Impacts of roads on resource availability will vary from year to year and will depend on multiple factors including traffic rates, environmental factors affecting caribou movement, and hunter adaptation to changes.

Displacement of Caribou Due to Air Traffic Disturbance

During construction, fixed-wing airplanes would be the primary source of air traffic, with helicopters used to support ice road construction, surveying, and monitoring (CPAI 2018). Once the airstrip is constructed, air traffic to the Project area would likely increase to multiple daily flights throughout the life of the Project, although at slightly lower levels during the drilling and operations phases. Helicopter traffic would occur on a periodic basis throughout the life of the Project.

Caribou responses to air traffic disturbance and related impacts on caribou hunters are discussed in Willow MDP Supplemental EIS Sections 3.12, *Terrestrial Mammals*, and 3.16, *Subsistence and Sociocultural Systems*. Until recently, air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting to the Nuiqsut Caribou Subsistence Monitoring Project (CPAI 2018; SRB&A 2018a; SRB&A 2019b, 2021). Air traffic could cause direct and indirect disturbances to caribou availability both within and outside of the alternatives analysis area. Nuiqsut hunters have observed that caribou behavior often changes in response to air traffic, particularly helicopter traffic and fixed-wing traffic at low altitudes. Observed behavioral responses include caribou "scattering" rather than remaining in groups where they are easier to hunt, acting skittish, and deflecting away from the source of noise or away from riversides (where hunters wait for them) (SRB&A 2010a, 2011, 2012, 2013b, 2014, 2015, 2016, 2017a, 2018a; SRB&A 2019b, 2020a, 2021). Hunters have frequently recounted experiences where a potentially successful harvest was disrupted by air traffic overhead, with caribou diverting to locations too far from riversides for hunters to access.

Increased air traffic associated with the Project would likely affect hunting activities in overland areas and along rivers, including the Niġliq Channel and the Colville River upriver toward Ocean Point. The increase in overall air traffic in the region associated with the Project would increase the frequency of disturbances experienced by Nuiqsut hunters. According to SRB&A (SRB&A 2021), the area west of Nuiqsut accounts for a substantial percentage of Nuiqsut's annual caribou harvest, and increased air traffic within that area could affect Nuiqsut harvesting success during the construction and operation phases. Impacts of air traffic to caribou resource availability would be most likely during the summer oestrid-fly season and in the fall when caribou migrate in an easterly direction, often crossing through the Project area into areas heavily used by Nuiqsut caribou hunters (Willow MDP Supplemental EIS Figures 3.16.9 through 3.16.12; Figure E.16.2 in Willow MDP FEIS Appendix E.16). However, air traffic impacts could occur year-round.

Displacement of Caribou Due to Other Infrastructure and Sources of Disturbance

Other potential sources of impacts to caribou availability include construction noise (including noise associated with gravel mining), drilling noise, general human activity, and contamination events. These potential impacts to Nuiqsut subsistence resource availability are discussed in Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*. Noise associated with gravel mining (including blasting), mining equipment and machinery, and excavation, could cause caribou to avoid the mine site area or to act skittish. Blasting and excavation would occur over six construction seasons, primarily during the winter months, when caribou hunting levels are reduced. While winter is not the peak caribou hunting season for the community of Nuiqsut, harvests occur when caribou are available in the area and when households are in need of meat. Winter harvests are often an important source of food when stocks of summer and fall subsistence foods begin to run low. Winter caribou harvests have been documented occurring to the west and north of the community, including near

the proposed mine site. Access to winter ice roads may help offset some of the impacts to resource availability during this time; however, gravel haul ice roads, which would be the primary ice roads located within the community's hunting area, would be off-limits to subsistence users. Module transport ice roads would see less traffic than gravel haul ice roads and community use would be restricted only during ice road construction and active hauling of the modules. In addition to noise associated with mining, the presence of the mine pits could deflect movement of caribou year-round, resulting in localized changes in distribution. The mine pits would be allowed to fill with water following construction and would therefore no longer be suitable habitat for caribou, thus affecting availability of caribou in the immediate area.

Other disturbances associated with construction noise, general equipment operation, human presence and activity, and drilling noise could result in temporary avoidance behavior or deflection of caribou, thus affecting resource availability. Studies show that caribou, especially females with calves, avoid drilling sites, and caribou that do approach drilling sites spend less time feeding and lying down (Fancy 1983; Lawhead, Prichard et al. 2004).

Resources which are perceived as contaminated by subsistence users are often considered unavailable for subsistence use (SRB&A 2009); during a recent Bureau of Ocean Energy Management–funded study, 47% of Nuiqsut households reported avoidance in the previous year of certain subsistence foods due to concerns about contamination (SRB&A 2017b). Use and storage of hazardous materials, solid waste, and drilling waste; generation of air emissions; treatment and disposal of wastewater; and dust deposition, could result in real or perceived degradation of caribou habitat. If individuals perceive or confirm caribou to be contaminated and avoid harvesting caribou that feed near the Project, they may experience reduced caribou resource availability.

Displacement of Furbearers

Potential disturbances of wolf, wolverine, and other furbearers are discussed in Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*, and in Appendix E.12, *Terrestrial Mammals Technical Appendix*. Wolf and wolverine are the primary furbearer resources harvested by Nuiqsut and Utqiaġvik subsistence users in the Alternative B analysis area. Although a higher number of overall caribou harvesters use the area, a higher percentage of wolf and wolverine harvesters—individuals who generally represent a smaller portion of the population and tend to be particularly active harvesters—use the area. During the construction phase, noise and other potential sources of impacts would be highest in winter, when most construction activities (e.g., pile driving, gravel mining, ice road operation) would occur. These activities would displace furbearers near Project activities.

Furbearer harvesters have observed reduced availability of wolf and wolverine near development and human activity, noting their sensitivity to noise and human activity, and their general tendency to avoid developed areas. Throughout the life of the Project, furbearers are likely to avoid areas with equipment and infrastructure or areas with high levels of human activity, noise, and ground traffic. Ground traffic and construction and mining noise would be highest during the winter construction months when furbearer harvesting activities are at their peak. Construction is expected to occur over a period of approximately 7 years with varying levels of intensity. Because wolf and wolverine hunting areas are generally large, accessible by snow machine, and extend in various directions from the community, residents would likely use different areas where the resources are believed to be more available, particularly during the construction phase. However, in some cases, subsistence users may have to expend more effort or go farther because the area to the west of the community is a commonly used and easily accessible area. Furbearer hunters often have specific areas where they prefer to hunt, and a temporary decrease in resource availability in those areas has been reported in recent years as a result of development activities (SRB&A 2022). Operations impacts would be similar to construction but would continue throughout the life of the Project (30 years) at somewhat lower levels. For Nuiqsut, high numbers of overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5, while low to moderate overlapping use areas occur around BT4. For Utqiaġvik, low to moderate overlapping use areas occur throughout the western portion of the alternatives analysis area, with greater intensity to the west and southwest of the analysis area.

Displacement of Other Resources*

While caribou, wolf, and wolverine are the primary resources harvested directly within the alternatives analysis area, goose hunting occurs directly to the east and north of the mine site and to the east of the proposed gravel access road along the Colville River, fishing (primarily for broad whitefish, a key resource for the community of Nuiqsut) occurs downstream from the alternatives analysis area on Fish Creek, and seal and eider hunting occurs in Harrison Bay near Oliktok Dock. Waterfowl hunting peaks during May when residents travel by snow machine to inland and riverine areas where white-fronted goose is known to be abundant (Willow MDP Supplemental EIS

Appendix E.16). While most construction activity would be complete before goose hunting begins, it is possible the ice road season would overlap with the beginning of the waterfowl hunting season in late April. Additionally, blasting at the gravel mine pits may occur into April. Thus, traffic and mining noise may result in temporary displacement or disturbance of waterfowl at the beginning of the hunting season, potentially causing a temporary decrease in harvester success. Recently, Nuiqsut harvesters reported impacts to goose hunting during the 2020 hunting season as a result of disturbance from helicopter traffic, indicating that geese left their hunting area after a helicopter flew overhead and did not return to the area for several hours (SRB&A 2022). Similar disturbances may continue to occur in association with the Project, but are not expected to cause overall impacts to resource availability for the community, as the mine site and ice roads are at a substantial distance from areas of high overlapping use for goose hunting, and activities would likely cease before the primary goose hunting season began (Willow MDP Supplemental EIS Sections 3.11, *Birds*, and 3.16, *Subsistence and Sociocultural Systems*).

While the Colville River and CRD are the primary fishing areas for the community of Nuiqsut, a number of families travel to Fish Creek and stay at fish camps to set nets for broad whitefish during the summer (July and August) and fall (September and October) months (SRB&A 2010b). Other fish resources harvested along Fish Creek, although in lesser quantities than broad whitefish, include burbot (in winter), Dolly Varden, and Arctic grayling (SRB&A 2010b). While construction activities, noise, and infrastructure (e.g., ice roads) may temporarily block or displace fish upstream and downstream, these impacts would be relatively localized and would not be likely to affect harvesting activities that generally occur a substantial distance downstream along Fish Creek (Willow MDP Supplemental EIS Section 3.10, *Fish*). In addition, ice infrastructure over stream channels would be removed, breached, or slotted before spring breakup to minimize blocked fish passage (Willow MDP Supplemental EIS Section 3.10). Water withdrawals to support ice infrastructure construction could alter fish habitat in some freshwater lakes, but these alterations would be temporary and are not expected to affect fish populations in Fish Creek (Willow MDP Supplemental EIS Section 3.10). Use of lakes in the alternatives analysis area for fishing is limited (see Willow MDP Supplemental EIS Appendix E.16). The primary potential impacts to fish resource availability would be related to real or perceived contamination of the Fish Creek drainage. If a spill occurs or if residents perceive that activities upstream from their fish camps are contaminating the water, they may perceive that the fish are unsafe to eat and reduce harvesting activities in the area (Willow MDP Supplemental EIS Section 3.16). Although unlikely, a larger oil spill could affect residents' fish harvesting in the Fish Creek drainage in the long term. The Wetlands Compensatory Mitigation Plan (Appendix I.4 of the Willow MDP Supplemental EIS) includes establishment of the Cape Halkett Preservation Area, which would preserve 800 acres that are privately held and available for development located between Nuiqsut and Utqiaġvik. Preservation of areas around Cape Halkett would reduce potential long-term impacts in the area.

Oliktok Dock would be used under all action alternatives for the delivery of Project construction materials. Nuiqsut harvesters use the offshore area near Oliktok Dock to hunt bearded seal (41% of harvesters), ringed seal (35%), and eiders (39%). Increased barge and vessel activity would occur in an area of low to moderate offshore Nuiqsut subsistence use for these resources, with areas of high overlapping use occurring directly west of the dock area in Harrison Bay. Increased barge and vessel traffic in the vicinity of Oliktok Dock, in addition to noise associated with screeding and lightering, could displace eiders and seals in the vicinity of these activities. During those years, some residents may periodically experience decreased seal harvest success due to the increase in overall traffic near Harrison Bay. However, activities at Oliktok Dock would occur in areas of existing industrial disturbance and would not involve the construction of new infrastructure; therefore, these activities would be additive rather than introduce impacts into previously undeveloped areas.

In addition to an increase in barge and vessel traffic in Harrison Bay and near Oliktok Dock, barges and vessels associated with the Project may also traverse through whaling grounds for other North Slope communities, including Utqiaġvik and Wainwright. Barge and vessel traffic would be additive to existing marine traffic but could result in periodic disturbances if they traverse through a community's whaling grounds during their whaling season. Such disturbances could have large effects on a community if whales are displaced and affect harvester success. However, permittees proposing barging activities are required, in accordance with ROP H-1, to coordinate with the Alaska Eskimo Whaling Commission, community whaling captains' associations, and the NSB. Such coordination often involves participation in Conflict Avoidance Agreements which are highly effective at minimizing impacts to whaling crews (SRB&A 2013a) (Willow MDP Supplemental EIS Section 3.16.2.3.2.5). Barge and vessel traffic associated with the Project are not likely to affect Nuiqsut whaling activities, as crews hunt whales from Cross Island, east of the Project, during their east to west migration.

Several other resource uses have been documented in and around the alternatives analysis area but are not regularly documented and not considered to be primary uses of the area. These include moose hunting and vegetation harvesting along Fish Creek. Moose are rare within the Project area, and eider hunting occurs primarily in offshore and nearshore areas of Harrison Bay. Vegetation harvesting has been documented along Fish Creek; however, it is unlikely that impacts to vegetation resulting from dust deposition would extend to harvesting areas downstream from the Project.

*Access to Subsistence Resources**

Potential impacts to harvester access are discussed in Willow MDP Supplemental EIS Section 3.16. A 1,000-foot safety radius around all Willow facilities would be in place and would prohibit the discharge of firearms within those areas; additionally, CPAI asks hunters not to shoot in the direction of work areas, human activity, and infrastructure. In certain areas, the presence of infrastructure and human activity, and associated safety considerations, could reduce the area in which residents can hunt by up to 2.5 miles, depending on the firearm being used (Willow MDP Supplemental EIS Section 3.16). Thus, a portion of traditional harvesting areas would be inaccessible to subsistence users from construction through the life of the Project. However, Nuiqsut subsistence users would be permitted to use most roads to access subsistence harvesting areas as long as they follow established security protocols, and hunters do use areas and harvest resources within 2.5 miles of existing roads. Gravel haul ice roads would generally be off limits to Nuiqsut harvesters due to heavy traffic levels. Module transport ice roads would see less traffic than gravel haul ice roads; these roads would be restricted from local use during ice road construction and the active hauling of the modules, with some potential for periods of local use. Thus, while much of the Project footprint would be legally accessible to subsistence users throughout the life of the Project, certain areas, particularly during construction activities, would be inaccessible to local residents and may result in residents having to divert around infrastructure to access subsistence harvesting areas, or may act as a physical barrier or obstruction to harvester access. Additionally, the presence of humans and infrastructure would affect subsistence harvesting patterns in and around the development area due to safety concerns, thus rendering some areas unusable for subsistence purposes under certain conditions.

During much of construction, access to the Project area would be limited to overland travel or via ice roads during winter, which would be open from February to April, but would be limited to ice roads not used for gravel hauling or module transport activities. Some residents—particularly those without snow machines—may use ice roads to access caribou herds farther from the community if they are not available closer by. However, the gravel haul ice roads, which are close to the community's hunting areas, would be off limit to subsistence users, and individuals traveling by snow machine may have difficulty crossing over these ice roads safely due to high traffic volumes. While the winter is not a primary hunting time for caribou, residents do hunt this resource, particularly in February and March (SRB&A 2021) to supplement their diet as needed throughout the winter. It is unlikely that furbearer hunters would use ice roads for wolf and wolverine hunting, as most individuals would begin snow machine hunting trips directly from the community and are not expected to hunt for these resources near human activity and infrastructure. If wolf and wolverine hunters want to cross over gravel haul and module transport ice roads to access areas farther from the community, they may experience difficulties due to the high traffic volumes and access restrictions. As gravel roads are gradually constructed, year-round access to the Project area via road automobile would increase. Gravel roads would extend the current area accessible by automobile for local residents and would likely be used, to some extent, for summer and fall caribou hunting, as well as during the winter. Use of roads would be particularly likely for residents who do not have access to alternate modes of transportation (e.g., boats, snow machines, ATVs), who have limited time to engage in subsistence activities, or who have health or other issues that make overland travel difficult.

In addition to Project roads, under Alternative B (Proponent's Project), CPAI would construct up to three boat ramps specifically for subsistence use. One of the boat ramps (common to all action alternatives) would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and GMT-1. Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish Creek pending further community input. The boat ramps would be accessible from existing Project roads with the addition of short access roads. Subsistence mapping data indicate limited travel along the Ublutuoch (Tiŋmiaqsiuġvik) River by boat; however, if it is possible for individuals to access Fish (Iqalliqpik) Creek via the Ublutuoch (Tiŋmiaqsiuġvik) River using boats (Figure 3.8.3 in Appendix A, *Figures*), the boat ramps could have substantial benefits to some users. Use of Fish (Iqalliqpik) Creek for subsistence purposes has declined in recent years with residents citing fuel costs and difficult travel and navigation conditions (e.g., shallower waters near the mouth of Fish [Iqalliqpik] Creek) for the decline in use. A boat ramp that facilitates access to Fish (Iqalliqpik) Creek could

increase use of this traditionally important subsistence harvesting area. Of the three proposed boat ramps, residents would be most likely to use the boat ramp closest to the community (on the Ublutuoch [Tiŋmiaqsiuġvik] River), as it would require less travel and would provide more immediate access to the lower, most heavily used portions of Fish (Iqalliqpik) Creek where most traditional camps are located. However, the boat ramps farther upriver on Fish and Judy (Iqalliqpik) creeks would also provide a benefit to the community, particularly in the event that the Project reduces the availability of certain resources, such as caribou, near the community. Accessing the upriver areas of Fish and Judy (Iqalliqpik) creeks would allow residents to access areas that are currently not frequently used due to the long boat ride from the community, high costs associated with such travel, and reported difficulties in recent years navigating into the mouth of Fish (Iqalliqpik) Creek by boat. Access to these areas may result in a shift to the community's boat hunting areas, but it could also provide access to new areas with greater concentrations of caribou in areas that are considered less affected by development (e.g., to the west of the current Prudhoe Bay/Kuparuk/Alpine development complex).

Recent data from Nuiqsut households indicate that the percentage of households using roads decreases somewhat with distance from the community, or in areas with high concentrations of drill sites. For example, while 53% of households reported using the Spur Road extending north from the community in 2019, 44% reported using the road between CD5 and GMT-1, and 31% reported using the road between GMT-1 and GMT-2. In addition, only 11% used the roads crossing east of the Niġliq Channel toward the CD1 and CD4 developments (Willow MDP Supplemental EIS Section 3.16). Data are not available at this time to determine why road use declines with distance from the community, but reasons could include lack of time (residents report using roads due to the ease of access during times when they are unable to take longer trip), lack of money or fuel to take longer trips, or successful harvests closer to the community. Decreased use of roads to the east of Niġliq Channel could be due to a relatively lower abundance of resources in that area, or due to heightened concerns about safety due to the greater concentration of infrastructure and human activity. Thus, because of the greater distance of Project roads from the community and the relatively higher density of infield roads and drill pads (compared to the GMT and Alpine developments), particularly near the junction of the access and infield roads where the airstrip, WPF, and WOC would be located, use of Project roads may be somewhat lower than other industry roads closer to Nuiqsut. Once Project roads and infrastructure are complete, they may introduce additional concerns for residents hunting along existing roads, particularly between GMT-1 and GMT-2, as there would be fewer directions in which to shoot without consideration of human safety.

Roads would act as a physical impediment to those traveling overland, or to those traveling on or off roads to access use areas. Tundra access ramps and road pullouts at regular distances would reduce issues with off-road travel. However, some Nuiqsut hunters report difficulty crossing onto or over existing roads, even using existing tundra access ramps, particularly when hauling a heavy sled (SRB&A 2018a; SRB&A 2021). Recent upgrades to these ramps, consisting of a more gradual slope, ramps on both sides of the road, and the inclusion of a landing area at the top of each ramp, have increased the usability and safety of the ramps according to caribou harvesters. Some concerns remain regarding the placement of the ramps in low areas where spotting for caribou is difficult (SRB&A 2022). While tundra access ramps would reduce impacts to access, residents may have to travel extra distances to access crossing areas if they are traversing overland. Project roads would be built under CPAI's Insulation Implementation Plan (see Appendix D.1, *Alternatives Development)*. Under this plan, CPAI would use insulated embankments along approximately 80% of gravel road length. Nuiqsut harvesters have reported difficulties both crossing over roads in areas with steep embankments, and spotting caribou in areas where roads block long-distance views. The insulated embankments would lower the overall height of the road and therefore could help reduce impacts associated with crossing over gravel roads and spotting caribou. Ice roads would not include tundra access ramps but would likely have a smaller slope that would pose less of a barrier to travel; however, crossing over ice roads may be difficult due to high traffic volumes and restricted access along certain routes. The mine pits, which would be located on either side of the highly used Ublutuoch (Tiŋmiaqsiuġvik) River drainage, would also act as a physical barrier to harvesters traveling overland; residents traveling by snow machine or ATV would have to divert around the mine site during construction and in subsequent summers when the mine would fill with water. Pipelines would be placed a minimum of 7 feet above the surrounding ground surface and would generally be high enough for harvesters to cross underneath on snow machines or ATVs. CPAI's Compensatory Mitigation Plan (Appendix I.4) would include Nuiqsut Subsistence Trail Tundra Rehabilitation project, which would implement measures to rehabilitate a degraded tundra trail near Nuiqsut. In recent years, residents have reported concerns about the condition of certain ATV trails and their navigability and safety (SRB&A 2022). These trails are primarily used by ATV hunters to access areas west of the Nuiqsut. The

Nuiqsut Subsistence Trail project would install a material on the trail surface which would support the weight of ATVs while allowing vegetation growth through its open cell design. Rehabilitation of local trails would improve access and safety for ATV hunters, particularly those who do not use roads to hunt or when caribou are available closer to the community and farther from Project roads. CPAI would implement a similar project in Anaktuvuk Pass.

*Competition with Non-Federally Qualified Users**

Subsistence harvesters on the North Slope have increasingly reported impacts related to competition from non-federally qualified users, often referred to as sport hunters by local residents. Alternative B will likely not result in a direct increase in competition from non-federally qualified users, as the permittee would prohibit hunting and trapping by employees, agents, and contractors while on "work status" (see Willow MDP Supplemental EIS Table 3.16.4, ROP H-3). Competition with non-federally qualified users may occur under the cumulative case and is discussed in Section B.9.a.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The Naval Petroleum Reserves Production Act of 1976, as amended, instructs the Secretary of the Interior to conduct oil and gas leasing in the NPR-A. Congress authorized petroleum production in 1980 and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve. In 2012, the NPR-A IAP/EIS analyzed impacts of future development in and around the Alpine development, including potential development in the BTU. In 2018, BLM completed an analysis of the potential impacts of development of the GMT-2 site, including a road connecting the GMT-2 site to the existing GMT-1 site located to the northwest of Nuiqsut. The Section 810 analysis for the GMT-2 project also considered development of the BTU in its Evaluation and Findings for the Cumulative Case. The purpose of the Willow MDP EIS is to analyze impacts specific to the Willow MDP alternatives to aid in differentiation of impacts between the alternatives and to provide information to agencies and other stakeholders so that they can make informed decisions regarding the Project's development. The Project was designed to develop oil from a delineated reservoir on valid leases within the NPR-A. Other lands managed by BLM are too distant to access the BTU reservoir using current drilling technologies.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would reduce the use of public lands needed for subsistence purposes. The Willow MDP Supplemental EIS Appendix D, Section 3.1.3, *Alternative Components Considered but Eliminated from Further Analysis*, discusses other alternatives (or alternative components) that were considered but eliminated from detailed analysis due to economic, or technological feasibility or practicability, or because they did not meet the purpose of the proposed action to produce the oil discovered on CPAI's leases.

d. Findings

1. **Reductions in the availability of subsistence resources described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.**
2. **Limitations on subsistence user access described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that development of Willow MDP EIS Alternative B (Proponent's Project) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative B

The Project is likely to deflect TCH caribou from areas where Nuiqsut hunters harvest them. Caribou are a resource of major importance for Nuiqsut. The majority of caribou hunting in the Project area occurs in the

eastern portion of the area surrounding the proposed gravel mine site and access road. Caribou would have to cross through the Project area before being hunted in overland areas west of the community and along the Niġliq Channel and Colville River. Deflection would likely occur due to reduced habitat, roads, road traffic, aircraft traffic (overhead flights and take offs and landings), construction noise (including mining activity), drilling noise, and general human activity.

Project roads have a high potential to disturb TCH caribou. Under Alternative B, the gravel access road would bisect the fall migration corridor for a portion of the herd and would be located in an area heavily used by TCH caribou in some years, both summer and winter. According to Nuiqsut residents, roads pose both physical and visual barriers to caribou and it has been observed that changes in caribou distribution and behavior around roads results in decreased availability of caribou closer to the community. Additionally, when caribou are near roads and pads, the availability of these animals is diminished due to safety considerations as residents do not shoot toward infrastructure or areas of human activity.

Impacts related to roads, and roads collocated with pipelines, would extend beyond the Project area. Although caribou are highly mobile during mosquito and oestrid fly seasons, deflected movements and delays are more common where roads and pipelines are close to one another. Project development would result in a second set of pipelines alongside existing pipelines from the GMT-2 drill site to the Alpine development. Deflected movement and delays would also be more common when traffic rates reach and exceed 15 vehicles per hour. Project development would also increase road traffic along existing roads connecting the Project area to the existing GMT-2, GMT-1, CD5, and Alpine developments. These traffic rates would be more common during construction, but it is likely that caribou deflections would continue at a lower intensity during the operations phase.

The Alternative B access road would create a pinch point where it intersects with infield roads, which could deflect some caribou away from the road during the fall migration. What could be small changes in caribou distribution from a biological perspective could have large impacts on hunter success because hunters are generally limited in how far and how fast they can travel, particularly during the snow-free season. Impacts on the availability of TCH caribou would most likely occur during the summer and fall months, when caribou hunting in overland areas and along the Colville River is highest. Deflections or delays of several hours could have substantial impacts to harvesting success for residents hunting east of the road corridor, and particularly to hunters waiting along river corridors.

The location of the proposed gravel mine site could be particularly disruptive to both caribou and hunters. The site is directly west of Nuiqsut in an area commonly reached by hunters traveling overland. Although blasting and excavation would occur during winter when caribou hunting levels are lower, Nuiqsut hunters do harvest caribou in the area in winter and the presence of the mine could deflect caribou movement year-round, resulting in localized distribution changes. The mine site would fill with water after construction and thus would no longer provide habitat for caribou; the mine site would remain as a pond(s) directly overlapping an overland hunting area west of Nuiqsut.

Air traffic could cause direct and indirect disturbance to caribou availability both within and outside of the Project area. In addition to helicopter traffic throughout the analysis area, the Project would include a new airport with large fixed-wing aircraft taking off and landing directly west of Ocean Point, a common hunting area along the Colville River. Increased air traffic associated with the Project would likely affect hunting activities along the Niġliq Channel and the Colville River, upriver toward Ocean Point and in overland areas west of Nuiqsut. The increase in overall regional air traffic associated with the Project would increase the frequency of disturbances experienced by hunters. This type of disturbance would most likely occur during summer and fall when caribou would migrate in an easterly direction through the Project area into areas heavily used by Nuiqsut hunters.

Project activities, particularly during construction, would reduce the availability of furbearers in the vicinity. The alternatives analysis area has been reported as being used by 88% of wolverine harvesters and 87% of wolf harvesters. The highest overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5; low to moderate use occurs around BT4. Impacts to furbearers would be highest in winter when pile driving, mine site blasting and excavation, and ice road operations would occur. These activities would displace furbearers. Residents would likely use other areas where furbearers would be more available, but hunters would likely have to travel farther with greater expense, effort, and risk, because the area west of the community is commonly used and easily accessible. While furbearers generally are not a food source for the community, furbearer hunting and trapping is a specialized activity with special importance to Nuiqsut.

BLM anticipates that altered distributions of the TCH caribou and furbearers would occur during construction and operation of the Project. As described above, this altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents to the east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for Finding of Limitations on Subsistence User Access Under Alternative B

A portion of traditional harvest areas would be inaccessible to residents during all Project phases, including land permanently overlain by infrastructure. Much of the Project area would be legally accessible, but infrastructure may act as a physical barrier or obstruction to harvester access. Subsistence users would be prohibited from discharging firearms within safety areas (1,000-foot radii surrounding oil and gas exploration, development, and transportation facilities other than roads) (CPAI 2019a, 2019b). Security protocols prohibit shooting toward infrastructure, people, work crews, equipment, and pipelines. The presence of humans and infrastructure would affect subsistence harvesting patterns in and around the Project area due to safety concerns, rendering some areas unusable for subsistence purposes (the range common to hunting with rifles is 0.5 to 3 miles).

Ice roads used for gravel hauling would be off limits for any other use. These roads would only be present during winter construction, which is not a primary caribou hunting period. However, residents do traditionally harvest caribou in winter along overland areas on the west side of Nuiqsut, particularly in February and March, to supplement their diet.

Access to the gravel mine area may be restricted during the construction phase. The mine site would be a physical barrier to harvesters traveling overland either by snow machine in winter or ATV in summer and fall. After construction, the mine site would be allowed to fill with water, and this would make the area inaccessible for overland travel in summer and fall.

Residents may use non-gravel haul ice roads and permanent gravel roads, once completed, to access subsistence areas. This facilitated access might provide a countervailing effect; however, use of roads declines with distance from the community. The use of Project roads may be lower than the use of roads closer to Nuiqsut (e.g., CD5, GMT-1) due to both the greater distance of Project roads from the community and the relatively high density of Project infield roads and drill sites. Industry road use is subject to standard safety rules, some of which would restrict use for some residents (e.g., no unaccompanied minors). During road construction, residents would not be able to use gravel roads and it may be difficult or impossible to cross them. Once road construction is completed, roads could be a physical impediment to overland travel; gravel roads may also prove to be difficult to gain access to or depart from to access subsistence use areas. Some Nuiqsut hunters have reported difficulty crossing existing gravel roads, even when using specifically constructed tundra/subsistence access ramps, particularly when hauling a heavy sled and in early spring when areas around roads and ramps thaw earlier than the surrounding tundra. Recent ramp upgrades have lessened but not eliminated these concerns. Crossing ice roads may be restricted due to heavy traffic and other roads may have periods of overall restricted access.

The totality of limitations on subsistence access associated with the Project, particularly during the 7-year construction phase but lasting through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents.

None of these impacts is expected to affect all subsistence hunters equally, and many of these impacts are uncertain. Caribou movement is highly variable; over time, some caribou may tolerate certain sources of disturbance (Willow MDP Supplemental EIS Section 3.12.2.3.2, *Disturbance or Displacement*), and harvesters may adapt to changes in resource availability to some extent. However, given the importance of caribou availability and access to traditional hunting areas to Nuiqsut hunters, BLM expects that limitations to subsistence access and the reduced resource availability anticipated to occur over the 30-year Project life, directly and indirectly attributable to Project development, would result in an extensive interference with Nuiqsut hunter access.

Nuiqsut residents have experienced limited access to their traditional subsistence lands and resources in large areas to the east, north, and west due to previous oil and gas infrastructure development, and they currently face substantial increasing development in those areas. As a result, their subsistence use areas have shifted away from developed areas. These impacts affect the relative value of remaining undeveloped land, including land that would

be overlain by Project infrastructure and lands adjacent to the Project where subsistence value would decrease due to Project development.

3. Evaluation and Finding for Alternative C (Disconnected Infield Roads)

The footprint for Alternative C (Disconnected Infield Roads) is similar to that of Alternative B (Proponent's Project), except there would be no gravel road between the WPF and BT1/BT2/BT4, and therefore no road and bridge crossing Judy (Iqalliqpik) Creek. This alternative would eliminate the perpendicular intersection of the access and infield roads included under Alternative B. Alternative C would also locate the WPF, WOC, and primary Project airstrip (south airstrip) approximately 1 mile to the northeast compared to Alternative B, somewhat closer to the community of Nuiqsut but into areas of lower TCH density. Only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under Alternative C due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish Creek. The mine site footprint (excavation and perimeter berms) under Alternative C would be approximately 80 acres larger than under Alternative B.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative C on subsistence would be similar to those described for Alternative B with three important differences:

1. Alternative C would reduce impacts to migrating caribou resulting from the elimination of the roadway "pinch point" between BT1 and the WPF and the relocation of the airstrip, WOC, and WPF into areas of lower TCH density.
2. Alternative C would increase the frequency and geographic extents of air traffic due to the need for additional air travel during the ice-free months and the addition of a second airstrip (north airstrip).
3. Alternative C would not include subsistence boat ramps on the upper Fish and Judy (Iqalliqpik) creeks.

Overall, Alternative C would require slightly higher levels of fixed-wing aircraft, helicopter, and ground traffic. However, ground traffic would be more concentrated in the winter months when caribou hunting activity is lower. The lack of a perpendicular road between the WPF and BT1 would decrease the potential for deflection of migrating caribou. The lack of access to the BT1/BT2/BT4 road corridor during the peak caribou hunting season would reduce ground traffic and hunting activity in that area, likely reducing deflection away from the access road and allowing caribou to move more freely along the Judy (Kayyaaq) Creek drainage. If the Project results in large-scale deflections of caribou despite the decrease in infield roads, hunters would have no summer or fall access to the BT1, BT2, and BT4 roads, nor would subsistence boat ramps on Fish and Judy (Iqalliqpik) creeks be constructed to mitigate effects by providing access to areas with heavier concentrations of caribou. Similar to Alternative B, Alternative C would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish (Iqalliqpik) Creek. Because the south airstrip, WOC, and WPF would be moved slightly farther east into areas of lower caribou density, impacts from air traffic may affect fewer caribou overall and could reduce deflection of caribou migrating toward the community's primary hunting area. However, moving the airstrip, WOC, and WPF closer to the community and core hunting areas may increase the frequency of disturbances to hunters related to aircraft takeoffs and landings, in addition to increased human activity. The increase in air traffic would be likely be offset by decreased ground traffic between the WPF and BT4, and lack of gravel infrastructure and associated human activity between the WPF and BT1 during the peak caribou hunting season. The long-term differences in direct impacts between Alternatives B and C are considered minimal because both alternatives would include a year-round access road to the west of Nuiqsut's core caribou hunting grounds. While air traffic would be substantially higher under Alternative C, impacts to caribou resource availability would likely be reduced under Alternative C due to the reduction in year-round infrastructure and ground traffic during peak hunting seasons.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.c.

d. Findings

1. **Reductions in the availability of subsistence resources described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.**

2. **Limitations on subsistence user access described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that development of Willow MDP EIS Alternative C (Disconnected Infield Roads) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative C

The rationale for the finding of reduced availability of subsistence resources under Alternative C is similar to that for Alternative B with a few distinct differences. Under Alternative C, the location of the WPF is an area with lower caribou densities, thus impacts to caribou from WPF-related traffic, activity, and noise would be somewhat reduced. The lack of subsistence hunter road access to infield roads between BT1 and BT4 may allow caribou to habituate to linear infrastructure more readily and allow caribou to establish a pattern of movement through (gravel) roadless corridor along Judy (Iqalliqpik) Creek. Ground traffic rates on these infield roads would likely be reduced during summer. Although increased air traffic would likely offset this to some degree, the reduced ground traffic may allow caribou to habituate to linear infrastructure. Overall, impacts to the disturbance of caribou under Alternative C could be reduced compared to Alternative B because more caribou may move north of the GMT-2-WPF access road due to the roadless corridor along Judy (Iqalliqpik) Creek. Currently, the majority of caribou hunting occurs in the eastern portion of the Project area near the proposed gravel mine and access road. Once this area is disturbed, the area north of the access road may have more caribou; however, restrictions on shooting toward pipelines would limit the actual availability of caribou hunting in the area.

Overall, despite the potential for reduced disturbance to caribou under Alternative C, BLM expects that altered distributions of TCH caribou and furbearers would occur during the Project's construction and operations phases. This altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative C

The rationale for the determination that interference with subsistence access would be extensive under Alternative C is identical to the rationale provided for under Alternative B (Section B.2.d.2) with the exception that under Alternative C, residents of Nuiqsut would not have all-season road access to the infield roads between BT1 and BT4.

4. Evaluation and Finding for Alternative D (Disconnected Access)

The footprint for Alternative D (Disconnected Access) is similar to that of Alternative B except there would be no gravel access road connection between the Project area and the GMT-2 and Alpine developments. Under this alternative, transportation to the Project area would be exclusively by aircraft for approximately 9 months of the year (May through January) and primarily via ice road for 3 months of the year (February through April). Gravel roads would connect the WPF, which would be colocated with BT3, to the other four drill sites and Project infrastructure. The WPF, WOC, and airstrip would be located approximately 3 to 4 miles southwest of their locations under Alternative B, thus possibly increasing human-related disturbances within areas of higher caribou density. However, overall, this alternative would reduce linear infrastructure on the landscape, remove the intersection of the access and infield road, and reduce year-round ground traffic with the goal of reducing impacts to migrating caribou. Similar to Alternative C, only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under

Alternative D due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish Creek. The mine site footprint (excavation and perimeter berms) under Alternative D would be approximately 80 acres larger than under Alternative B.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative D on subsistence would be like those described for Alternative B with one important difference: Alternative D would reduce impacts to migrating caribou resulting from the elimination of the gravel access road connecting the Project to the GMT-2 and Alpine developments. Overall, Alternative D would require higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round road access to the Project. On average, the increase in air traffic would amount to one or two additional fixed-wing aircraft trips per day for the life of the Project (32 years) and one additional helicopter trip per week during the drilling and operations phases; these trips would be more concentrated during the 9 months when there would be no ice road access. The increase in air traffic could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvest success for Nuiqsut hunters during individual hunting trips. The lack of a gravel access road running perpendicular to the fall migration route, in addition to the lack of ground traffic in that area throughout the summer and fall, would decrease the potential for deflection of caribou migrating through the Project area in the fall, or disturbance of caribou that occur in the area in the summer. While the WPF, WOC, and airstrip would be located farther west into areas of higher caribou density (therefore increasing the potential for disturbances in those areas), they would be farther from Nuiqsut's core caribou hunting grounds.

The lack of a year-round gravel access road under Alternative D means Nuiqsut residents would not have the benefit of access to the Project area via road for hunting. However, it is unclear how much residents would use the Project road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with increased distance from the community or in more densely developed areas (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*). Residents would still be able to use the road system to reach GMT-2 and hunt from those roads by ATV or snow machine. In addition, under Alternative D, there would no subsistence boat ramps on Fish) and Judy (Iqalliqpik) creeks to mitigate larger-scale deflections of caribou if they continue to occur despite the decrease in road infrastructure. Similar to Alternative B, Alternative D would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish Creek.

Per the Willow MDP Supplemental EIS, Alternative D may result in less impacts on caribou availability due to the lack of a year-round access road. While air traffic levels would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution, in addition to changes in caribou hunting patterns. Across the 12 years of the Nuiqsut Caribou Subsistence Monitoring Project and as development activity has increased in the vicinity of Nuiqsut, reports of air traffic impacts have remained somewhat stable, while reports of impacts related to human-made structures have increased. In addition, avoidance behavior and changes in hunting patterns have been more evident since construction of roads in the area (SRB&A 2019a; SRB&A 2021). Thus, it is likely that while the increase in air traffic would contribute to existing impacts to hunters, additional road infrastructure to the west of the community would substantially increase impacts to resource availability and hunter access. By eliminating a large portion of year-round road infrastructure to the west of the community, Alternative D would reduce deflection of caribou as they migrate toward Nuiqsut's core hunting grounds to the west of the community. Additionally, while the Project area would not be road-accessible year-round for Nuiqsut hunters, they would likely still continue to use existing roads and hunt in the area between GMT-2 and the Project area.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.c.

d. Findings

1. **Reductions in the availability of subsistence resources described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.**

2. **Limitations on subsistence user access described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that development of Willow MDP EIS Alternative D (Disconnected Access) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below. The rationale for these findings is similar to those described above for Alternative B (Section B.2.d, *Findings*) with key differences summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative D

Alternative D may result in fewer impacts on caribou availability than Alternative B due to the lack of a year-round gravel access road connecting the Project to existing development (e.g., GMT-2, Alpine); however, BLM still anticipates a major redistribution of resources would occur under this alternative. The lack of a gravel-access road alignment being perpendicular to the fall caribou migration and the lack of ground traffic in that area throughout the summer and fall would decrease the potential for deflection of caribou migrating through the area. Higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round access would overlap with peak caribou hunting months, which could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvester success for Nuiqsut hunters during individual hunting trips. The increase in air traffic would likely not be enough to outweigh the benefits of reduced deflection of caribou as they migrate toward Nuiqsut's hunting grounds to the west of the community. While air-traffic volumes would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution.

Many benefits of reduced deflection from the lack of an access road would be offset by the aircraft traffic (including take offs and landings of large fixed-wing aircraft) in addition to the combined effects of a linear pipeline along the route between GMT-2 and the Project, parallel pipeline racks between GMT-2 and Alpine facilities, Project infield roads, drill sites, and the WPF, the location of and activity at the gravel mine site, and other disturbances described above for Alternative B.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative D

The rationale for the determination that interference with subsistence access would be extensive under Alternative D is similar to the rationale provided for Alternative B with the exception that the lack of a year-round access road under Alternative D means that Nuiqsut residents would not have the potential benefit of access to the project area via road vehicle for hunting. It is unclear how much residents would use the Willow MPD road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with distance from the community or in more densely developed areas (Willow MDP Supplemental EIS Section 3.17). Alternative D would reduce limitations on overland travel but restrict access via roads. Residents would still be able to use the road system to GMT-2 and hunt off of those roads by four-wheeler or snow machine. Limitations to access described above for Alternative B resulting from direct overlap with subsistence use areas, safety areas around sites, road use guidelines, security protocols restricting shooting, and gravel haul ice roads would be similar under Alternative D.

5. Evaluation and Finding for Alternative E (Three-Pad Alternative, Fourth Pad Deferred)*

The footprint for Alternative E (Three-Pad Alternative, Fourth Pad Deferred) is smaller than that of Alternative B because Alternative E would exclude drill site BT4 and move the BT5 drill site to the northeast. Drill site BT2

would move farther north. This alternative would reduce infrastructure within the TLSA and reduce the overall length of gravel roads compared to Alternative B. Alternative E would reduce linear infrastructure in the portion of the Project farthest from the community of Nuiqsut and least used by Nuiqsut harvesters, but closer to high-density caribou calving and preferred mosquito-relief habitat. Alternative E would include the three subsistence use boat ramps proposed under Alternative B. Construction of BT5 would be deferred to Year 7 at the earliest. This Year 7 construction scenario is considered to be the most impactful and thus is the scenario analyzed in the Willow MDP Supplemental EIS. If BT5 construction is deferred beyond Year 7, the anticipated impacts related to BT5 would be delayed, resulting in extended temporal impacts, although the severity or intensity of the impacts would be lessened due to there being less overall Project activity (i.e., other construction activity) occurring simultaneously.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs*

The effects of Alternative E on subsistence would be like those described for Alternative B with one difference: Alternative E would reduce infrastructure in the TLSA, a key habitat and migratory area for caribou. The reduction in linear infrastructure could lessen the frequency or severity of deflection of caribou migrating toward Nuiqsut subsistence harvesting areas to the west of the community. Roads and pipelines within 500 feet of one another increase the likelihood of caribou displacement and deflection; under Alternative E, there would be a 30% reduction in the amount of pipeline within 500 feet of gravel roads. In addition, Alternative E would reduce infrastructure within the TLSA by 43% and move infrastructure (including roads, pipelines, and the nearest drill site) farther from high-density calving areas and mosquito-relief habitat (Willow MDP Supplemental EIS Section 3.12). Aside from the reduction in infrastructure described above, a key feature of Alternative B would remain under Alternative E: all drill sites under Alternative E would be connected to one another and to the existing GMT-2 development by gravel road. Thus, while the reduction in linear infrastructure within the TLSA may help reduce obstructions during the summer and fall migration, many caribou would still encounter roads, including the pinch point where the access road intersects with infield roads, during their migration south.

The reduction in infrastructure under Alternative E would primarily result in a lessening of indirect impacts (e.g., impacts related to resource availability resulting from deflection of caribou). Overall, a slightly smaller percentage of Nuiqsut harvesters (88%) would be affected under Alternative E compared to Alternative B (91%), and the difference occurs specifically among goose hunters (Willow MDP Supplemental EIS Section Table 3.16.5). Alternative E will also reduce infrastructure in Utqiaġvik areas of low to moderate use for wolf and wolverine, thus somewhat reducing the area of impact for hunters from that community.

In terms of direct impacts, the reduction in infrastructure within the TLSA would occur in an area that is not heavily used by Nuiqsut harvesters relative to the entire Project area. When looking specifically at the alternative analysis area where it intersects with the TLSA, under Alternative E, 67% of Nuiqsut all resources harvesters reported use areas compared to 73% under Alternative B (Willow MDP Supplemental EIS Table 3.16.9). For caribou during the 1995–2006 time period, just over half of harvesters (56%) reported use areas in the alternative analysis area where it intersects with the TLSA. A smaller percentage of caribou harvesters have used the area in recent individual study years (2008–2019), and no caribou harvests were reported in this area for any of the action alternatives (Willow MDP Supplemental EIS Table 3.16.9). Thus, while the decrease in infrastructure within the TLSA may reduce deflection of caribou and lessen impacts on resource availability for Nuiqsut harvesters, the difference in direct impacts on caribou hunters would be minimal.

Under Alternative E, there would be a slight reduction in air, ground, and marine vessel traffic. The reduction in traffic may reduce the frequency of impacts to hunters in addition to reducing impacts to resource availability resulting from skittish behavior in caribou, furbearers, marine mammals, and birds. A decrease in ground traffic would lessen the likelihood of vehicle strikes for terrestrial mammals.

Access to Project roads for Nuiqsut residents would be similar to Alternative B but with slightly less overall road length. It is unclear how far residents will regularly travel along Project roads, as recent data show a moderate decrease in road use with distance from the community (Willow MDP Supplemental EIS Section 3.16). Similar to Alternative B, Alternative E would construct a boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River and up to two additional boat ramps on Judy (Iqalliqpik) Creek and Fish Creek. These boat ramps would be accessible along the road system from the community and could provide access to key hunting areas on the lower portion of Fish Creek. Use of these boat ramps to access areas on Judy (Iqalliqpik) and Fish creeks could help offset impacts to resource availability associated with deflection of caribou from roads.

Overall, while Alternative E would not result in a substantial reduction in direct impacts to Nuiqsut subsistence harvesters, the reduction in infrastructure within the TLSA may reduce impacts to caribou habitat and lessen the frequency and likelihood of roads deflecting caribou away from Nuiqsut caribou hunting grounds.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved*

The evaluation of the Willow MDP EIS Alternative E is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that Would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes*

The evaluation of the Willow MDP EIS Alternative E is identical to that provided above in Section B.2.c.

d. Findings*

1. **Reductions in the availability of subsistence resources described above for Alternative E may significantly restrict subsistence uses for the community of Nuiqsut.**

2. **Limitations on subsistence user access described above for Alternative E may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that development of Willow MDP EIS Alternative E (Three-Pad Alternative, Fourth Pad Deferred) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below. The rationale for these findings is similar to those described above for Alternative B (Section B.2.d, Findings).

*1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative E**

The reduction in infrastructure under Alternative E may reduce deflection of caribou; however, the reduction in impacts to all resources will be minimal. Overall, a slightly smaller percentage of Nuiqsut harvesters (88%) would potentially be affected under Alternative E compared to Alternative B (91%), and the difference occurs specifically among goose hunters. The Project is likely to deflect TCH caribou from areas where Nuiqsut hunters harvest them. Caribou are a resource of major importance for Nuiqsut. The majority of caribou hunting in the Project area occurs in the eastern portion of the area surrounding the proposed gravel mine site and access road. Caribou would have to cross through the Project area before being hunted in overland areas west of the community and along the Niġliq Channel and Colville River. Deflection would likely occur due to reduced habitat, roads, road traffic, aircraft traffic (overhead flights and take offs and landings), construction noise (including mining activity), drilling noise, and general human activity.

Project activities, particularly during construction, would reduce the availability of furbearers in the vicinity. Impacts to furbearers would be highest in winter when pile driving, mine site blasting and excavation, and ice road operations would occur; these activities have the potential to displace furbearers from areas where they are traditionally harvested. While furbearers generally are not a food source for the community, furbearer hunting and trapping is a specialized activity with special importance to Nuiqsut.

Although the overall road and pipeline length would be reduced under Alternative E compared to Alternative B (with corresponding reductions in Project construction activity), these reductions would not be enough to completely prevent potential redistribution of caribou and furbearers. BLM anticipates that altered distributions of the TCH caribou and furbearers would occur during construction and operation of the Project under Alternative E. As described above, this altered distribution could have large impacts to hunter success due to how far and fast hunters can travel, and because there would be deflections or delays in caribou movement for residents to the east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this

would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters. See Section B.2.d for more details.

*2. Rationale for Finding of Limitations on Subsistence User Access Under Alternative E**

A portion of traditional harvest areas would be inaccessible to residents during all Project phases, including land permanently overlain by infrastructure. Much of the Project area would be legally accessible, but infrastructure may act as a physical barrier or obstruction to harvester access. Some Nuiqsut hunters have reported difficulty crossing existing gravel roads, even when using specifically constructed tundra/subsistence access ramps, particularly when hauling a heavy sled and in early spring when areas around roads and ramps thaw earlier than the surrounding tundra. Upgrades to existing ramps have reduced but not eliminated these concerns. Crossing ice roads may be restricted due to heavy traffic, and other roads may have periods of overall restricted access. Subsistence users would be prohibited from discharging firearms within safety areas (1,000-foot radii surrounding oil and gas exploration, development, and transportation facilities other than roads) (CPAI 2019a, 2019b). Security protocols also prohibit shooting toward infrastructure, people, work crews, equipment, and pipelines.

The totality of limitations on subsistence access associated with the Project, particularly during the construction phase but lasting through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents. See Section B.2.d for more details.

6. Evaluation and Finding for Module Delivery Option 1 (Atigaru Point Module Transfer Island)

Module delivery Option 1 (Atigaru Point Module Transfer Island) would include construction of an MTI near Atigaru Point to support sealift module delivery to the Project. Module delivery by sealift barge to the MTI would occur over two summers; the modules would be stored on the MTI and then transported from the MTI to the WPF via an ice road. Gravel would be hauled from the Tiŋmiaqsiuġvik mine site via ice road to the MTI site for construction. During construction, the MTI would house facilities such as an office, break room, and helipad; a temporary 100-person work camp would be located onshore near Atigaru Point. Construction facilities and supplies would be demobilized once construction was complete.

In the Willow MDP Supplemental EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary infrastructure, including the MTIs and associated module transport and gravel haul ice roads, for each module delivery option (module delivery option analysis area). While the MTI-associated activities would occur solely during the construction phase of the Project, the MTIs themselves would remain after module transport was complete. Differences in impacts between the construction and operation phases are discussed qualitatively. The module delivery option analysis areas do not include all areas where development-related activity (e.g., vessel traffic) or impacts would occur. The analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the analysis area are also addressed.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs*

The analysis area for module delivery Option 1 (Figure 12) lies within areas heavily used by Nuiqsut residents for subsistence. Between 1995 and 2006, a substantial proportion of Nuiqsut harvesters reported using the analysis area for harvesting of caribou, wolverine, and wolf (over 80% of harvesters each); and goose (over 50% of harvesters) (Willow MDP Supplemental EIS Table 3.16.11). These resources are harvested primarily in overland areas crossed by ice roads, particularly where the gravel haul ice road crosses Fish Creek and terminates at the mine site (Figures 13 through 16). Between 2008 and 2019, the percentage of caribou harvesters using the analysis area for Option 1 ranged from 33% to 78%; caribou harvests within the area ranged from 4% to 19% of the total harvest during individual study years (Willow MDP Supplemental EIS Table 3.16.12). Nuiqsut harvesters also use the offshore area in Harrison Bay surrounding the MTI for subsistence harvesting of bearded seal (33% of harvesters), ringed seal (26%), and eider (14%) (Willow MDP Supplemental EIS Table 3.16.11). Uses of the area directly to the east of the analysis area for these resources are higher (Figure 17). Twelve percent of Utqiaġvik harvesters reported using the Option 1 analysis area, primarily for wolf and wolverine, during the 1997 to 2006 time period (Figure 18). While the bowhead whale hunt is a culturally important subsistence activity and provides a large portion of the Nuiqsut's annual subsistence harvest, the community's whale hunting activities occur a substantial distance east of the potentially affected area, near Cross Island, and Nuiqsut whaling crews hunt whales in the fall during their east to west migration. Thus, impacts to Nuiqsut bowhead whale hunting associated with the Project are unlikely. On the other hand, whaling communities located to the west of

the Project, such as Utqiaġvik and Wainwright, could potentially encounter barges and vessels during their summer/fall whale hunting activities. While vessel traffic has the potential to disturb migrating whales and affect whaling success, the likelihood of large or frequent disturbances is low, because permittees proposing barging activities are required, in accordance with ROP H-1, to coordinate with the Alaska Eskimo Whaling Commission, community whaling captains' associations, and the NSB. Coordination with the Alaska Eskimo Whaling Commission typically involves participation in a Conflict Avoidance Agreement, which have been found to be highly effective at minimizing impacts to whaling activities (SRB&A 2013a) (Willow MDP Supplemental EIS Section 3.16.2.3.2.5).

As discussed in Section B.2.a, both caribou and wolf and wolverine are key resources to the community of Nuiqsut, and the analysis area is heavily used by both caribou and furbearer hunters in Nuiqsut. Other resources of major cultural and/or material importance harvested within the Option 1 analysis area include white-fronted goose and bearded seal (Table E.16.9 in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*). Thus, impacts to subsistence activities related to caribou, wolf, wolverine, goose, and seal are considered in the ANILCA Section 810 evaluation of module delivery Option 1. The analysis area for Option 1 is on the eastern periphery of Utqiaġvik subsistence use areas for wolf and wolverine but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents and includes areas of moderate to high overlapping subsistence use. Moderate overlapping subsistence use also occurs to the southwest of the Project toward Ikpikpuk River, which is a key subsistence drainage for the community of Utqiaġvik (Willow MDP Supplemental EIS Figure 3.16.4). Caribou are also harvested to the west of the Project; however, the analysis area is on the eastern periphery of the herd's range and is not expected to alter caribou migration routes to the extent that they would affect Utqiaġvik harvesting activities to the west. Thus, the ANILCA Section 810 evaluation for module delivery Option 1 focuses on impacts to furbearer harvesting for Utqiaġvik. As discussed in Section B.2.a, furbearer hunting does not provide substantial amounts in terms of food but is a specialized and culturally important activity that contributes to the local economy.

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Willow Subsistence Delivery Options 1 and 2 Analysis Areas with Proposed and Existing Infrastructure

Appendix G - ANILCA 810 Analysis

U.S. DEPARTMENT OF THE INTERIOR | BUREAU OF LAND MANAGEMENT | ALASKA | WILLOW MASTER DEVELOPMENT PLAN

Option 1: Atigaru Point Module Transfer Island

Option 2: Point Lonely Module Transfer Island

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

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Figure 12

Caribou Subsistence Use Areas by Module Delivery Options 1 and 2, Nuiqsut, 1995 to 2006

Option 1: Atigaru Point Module Transfer Island

Option 2: Point Lonely Module Transfer Island

Subsistence Data

- Overlapping Subsistence Use Areas Caribou, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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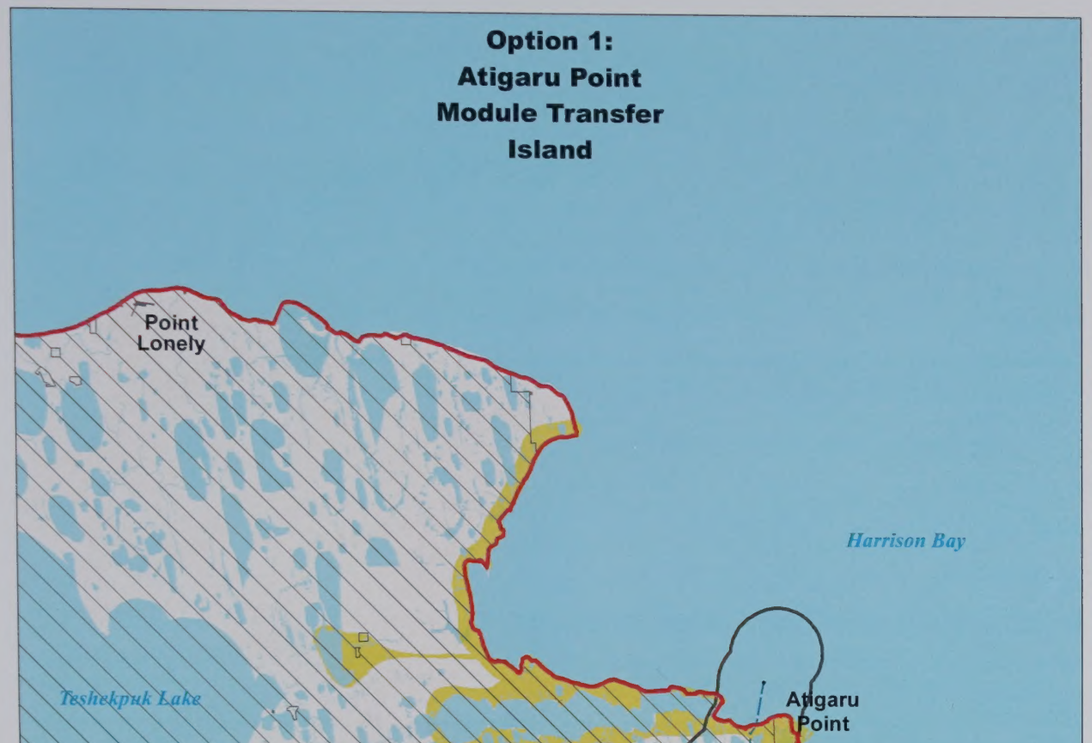
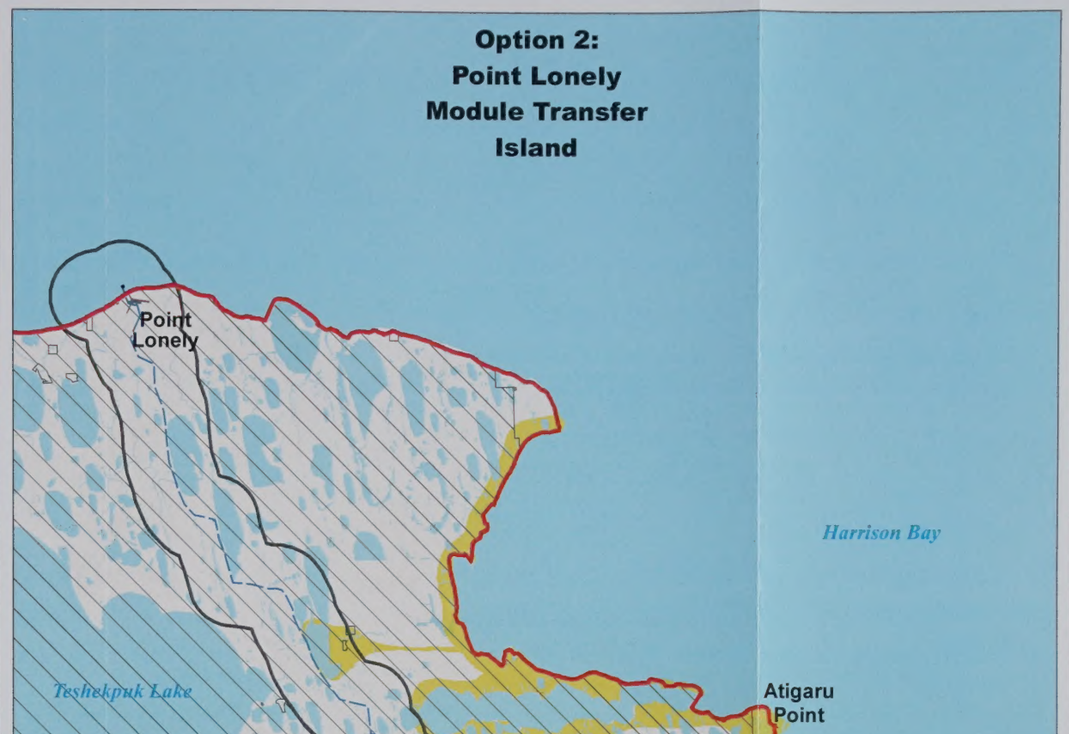
Figure 13





Subsistence Data

Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019[a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2021

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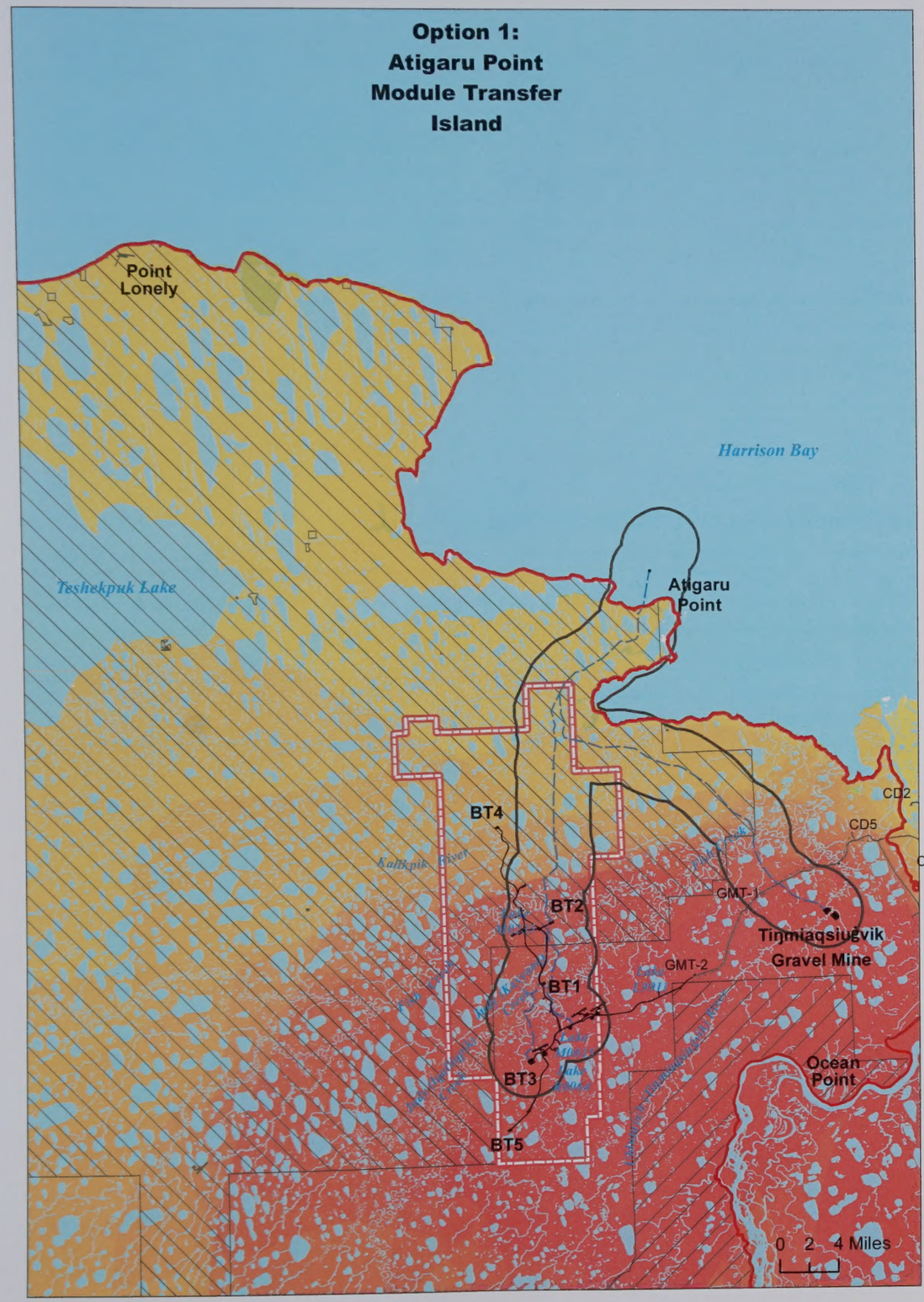
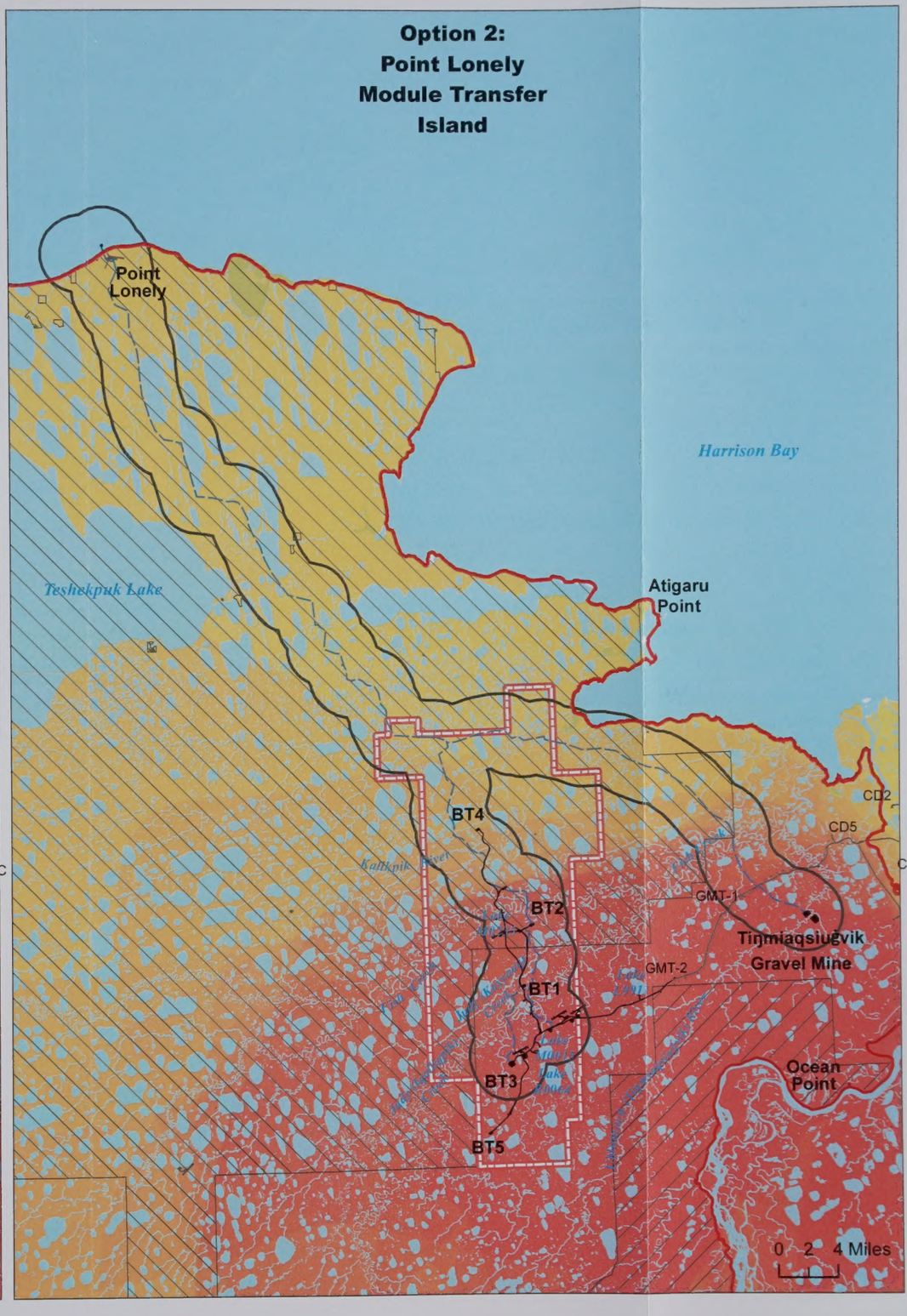
Figure 14

Wolf and Wolverine Subsistence Use Areas by Module Delivery Options 1 and 2, Nuiqsut, 1995 to 2006





Subsistence Data

- Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 15

Goose Subsistence Use Areas by Module Delivery Options 1 and 2, Nuiqsut, 1995 to 2006

Subsistence Data

- Overlapping Subsistence Use Areas Goose, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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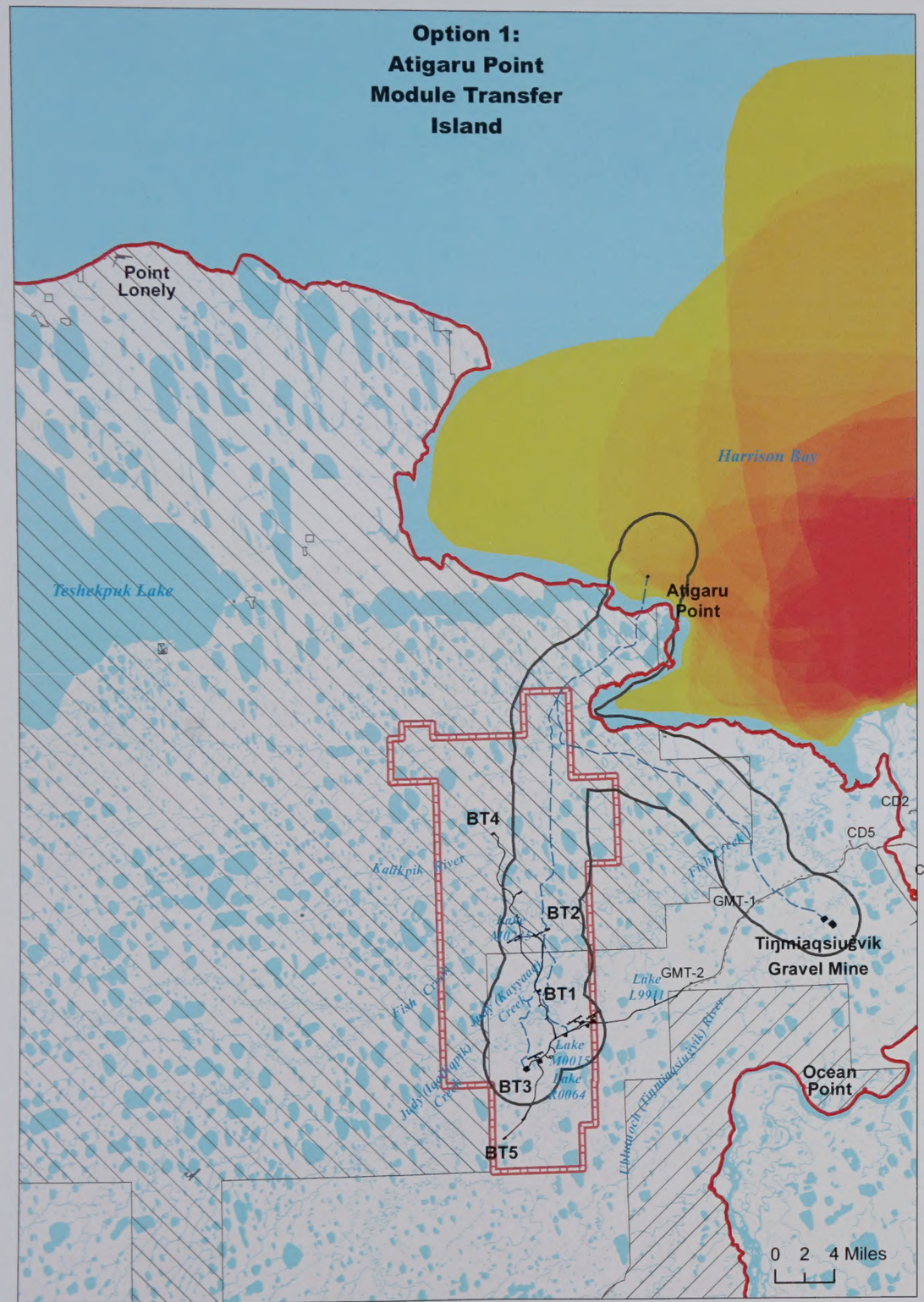
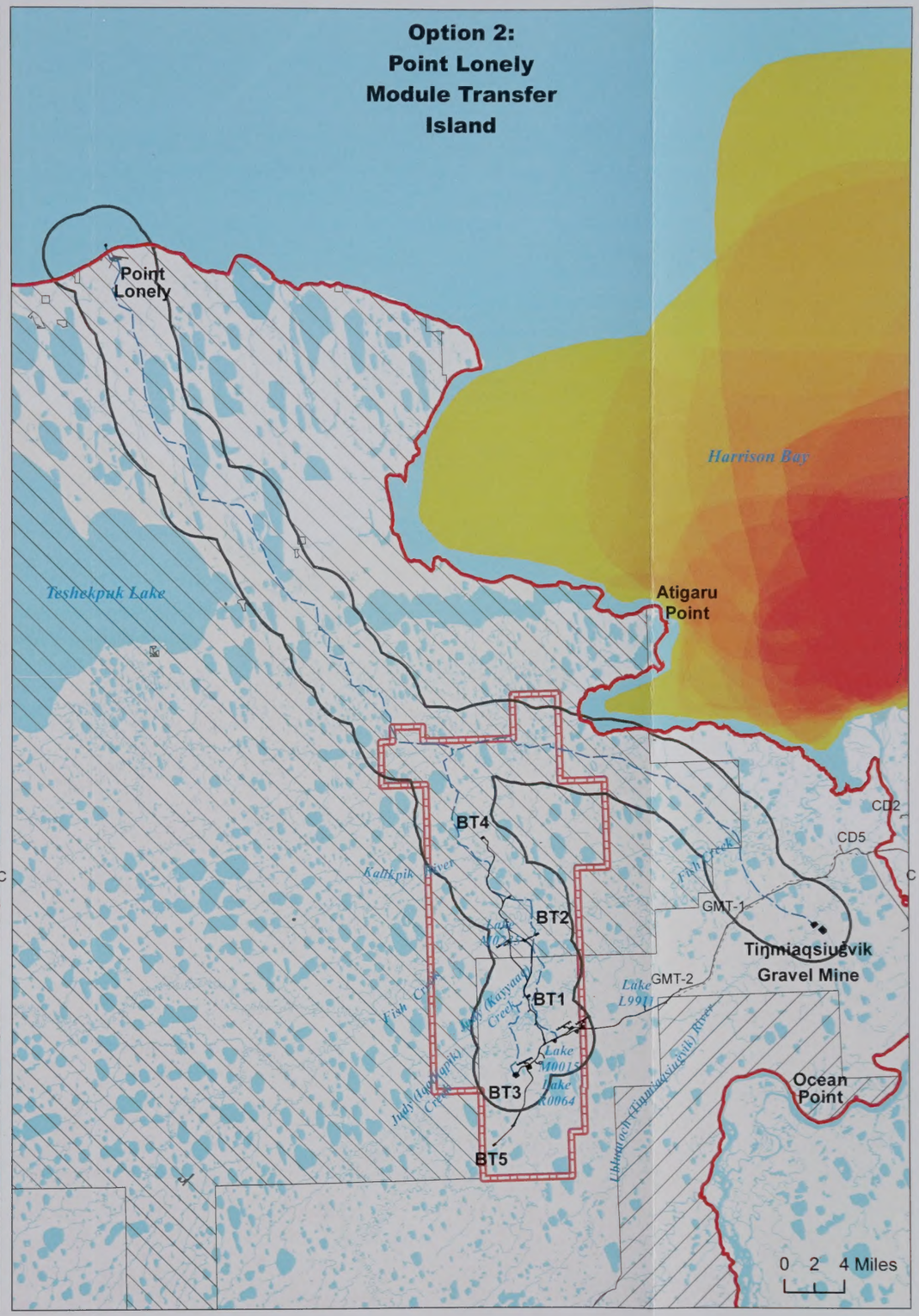
Figure 16

Seal Subsistence Use Areas by Module Delivery Options 1 and 2, Nuiqsut, 1995 to 2006

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

- Overlapping Subsistence Use Areas Seal, 1995-2006[a] (High / Low)

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
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Source
a. SRB&A 2010a

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Figure 17

Wolf and Wolverine Subsistence Use Areas by Module Delivery Options 1 and 2, Utqiaġvik (Barrow), 1997 to 2006

Subsistence Data
- Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006[a] (High / Low)

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 18

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Subsistence Resource Abundance

While construction activities associated with the MTI, including ice roads, would result in the temporary removal or disturbance of habitat for some resources and could cause direct mortality to individual animals, these are not expected to have population level effects on subsistence resources. Terrestrial mammals, including caribou, generally do not use sea ice habitat and therefore would not be directly affected by the MTI. Ice roads associated with the MTI occur within the TCH range but would be in an area of relatively low calving density (Willow MDP Supplemental EIS Section 3.12, *Terrestrial Mammals*). Traffic along ice roads, which would exceed 15 vehicles per hour during construction, could result in collisions and direct mortality of individual animals such as caribou. The area is not heavily used by caribou in winter and does not have a high density of wolf or wolverine; thus, the abundance of caribou, wolf, and wolverine available for subsistence use would not be impacted under module delivery Option 1.

While goose habitat occurs throughout the analysis area and could experience degradation or alteration, these changes are not expected to affect overall bird abundance. Individual mortalities could occur as a result of collisions with aircraft, vehicles, and infrastructure, but would not cause population-level effects (Willow MDP Supplemental EIS Section 3.11, *Birds*). Construction of the MTI would result in the direct loss of 12 acres of habitat for seals but is not expected to cause population-level effects to seals (Willow MDP Supplemental EIS Section 3.13, *Marine Mammals*). Fish, particularly broad whitefish, are harvested downstream from the proposed ice road crossing of Fish Creek. Nuiqsut residents generally do not harvest fish in Harrison Bay, but instead harvest them from river drainages. Water withdrawals for ice infrastructure could alter fish habitat but these alterations would be temporary and are not expected to affect fish populations in Fish Creek (Willow MDP Supplemental EIS Section 3.10, *Fish*). A large oil spill could have larger population-level effects to resource abundance, but such a spill is not expected to occur in association with the MTI or associated barging or ice road traffic (Willow MDP Supplemental EIS Sections 3.10, 3.11, and 3.13). Thus, the abundance of goose, seal, or fish available for subsistence use would not be impacted under module delivery Option 1.

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Supplemental EIS Section 3.16.1, *Affected Environment,* and in Willow MDP Supplemental EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. As noted above, use of the Option 1 analysis area for caribou hunting primarily occurs in the vicinity of ice roads—particularly gravel haul ice roads—associated with the MTI. The gravel haul ice road extending from the Tiŋmiaqsiuġvik mine site to Fish Creek occurs in areas of high overlapping use for Nuiqsut caribou hunting. Hunting along Fish Creek occurs by boat in the summer months; however, overland travel during the winter and summer months also occurs in the area between the mine site and Fish Creek. Hunting along Fish Creek by boat in the summer continues to be an important subsistence activity but the frequency has decreased in recent years; reasons for the decrease in use include difficulty accessing the mouth of Fish Creek due to increasingly shallow waters in nearshore areas near the mouth of the creek, and the high costs associated with traveling to Fish Creek via Harrison Bay (Northern Economics Inc. 2019; SRB&A 2019a). Subsistence boat ramps constructed as part of the Project may increase use of the Fish Creek area during the summer months. The overland area toward Fish Creek remains a heavily used area by the community of Nuiqsut during the summer and fall caribou hunting season and is primarily accessed by ATV, although residents increasingly access the area by truck along the road system. When traveling by ATV, residents can generally travel as far west as the Ublutuoch (Tiŋmiaqsiuġvik) River; however, access to the road system also allows residents to haul ATVs and travel farther toward Fish Creek than previously possible. Residents also hunt in coastal areas of Harrison Bay during the summer, with Atigaru Point being an important traditional hunting area where residents target TCH caribou during the insect relief season. In recent years, use of this area has decreased as a result of increased sedimentation and shallow waters along the coast, in addition to a reported decrease in the availability of caribou in the area (Willow MDP Supplemental EIS Section 3.16) (SRB&A 2018a).

Wolf and wolverine hunting within the Option 1 analysis area, particularly in the southern portions of the gravel haul and module transport ice roads, is similar to that described in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability, Displacement of Furbearers*), and occurs primarily in the winter months to the west, south, and southeast of the Nuiqsut. Hunting of wolf and wolverine is less common in the northern portion of the Option 1 analysis area (Figure 15). For Utqiaġvik, wolf and wolverine hunting occurs primarily around the module transport ice road but extends throughout the southern portion of the analysis area (Figure 18).

Goose hunting in the Option 1 analysis area occurs most commonly in areas where the gravel haul ice road intersects with Fish Creek but also to the north and east of the Tiŋmiaqsiuġvik gravel mine site. Most goose hunting along Fish Creek and in overland areas occurs by snow machine in the months of April and May (Willow MDP Supplemental EIS Appendix E.16). Seal hunting by Nuiqsut residents occurs throughout Harrison Bay by boat, with moderate overlapping use offshore from Atigaru Point; high overlapping use occurs directly east of Atigaru Point in Harrison Bay. Seal hunting peaks in the months of July and August (Willow MDP Supplemental EIS Appendix E.16).

Noise and traffic associated with the gravel haul and module transport ice roads, and the physical presence of the ice roads themselves, could affect the availability of caribou, wolf, wolverine, and goose for Nuiqsut harvesters, and the availability of wolf and wolverine for Utqiaġvik harvesters. Depending on annual conditions, ice roads may still be present in late April, when goose hunting along Fish Creek intensifies (Figure E.16.1 in Appendix E.16); thus, goose hunters could experience direct hunting impacts while the gravel haul ice road is operational. This would only occur during a single winter ice road season when gravel haul to the MTI would take place. See Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*), for a discussion of how roads and associated road traffic may affect the availability of caribou, furbearers, and other resources. Because MTI gravel haul and module transport ice roads would not be present during the fall caribou migration, it is unlikely they would cause overall changes in caribou distribution or migration; however, caribou may be deflected from ice roads in winter during times of heavy road traffic, affecting resource availability for caribou harvesters. Peak ground traffic levels associated with the MTI would reach up to 121 trips per hour in the winter and could have a high potential for disturbance. If ice roads are still in place and operational at the beginning of the waterfowl hunting season in mid-to-late April, residents may experience decreased harvesting success during this time for the single season during which the gravel haul ice road would be operational. Geese may be more easily disturbed or temporarily displaced due to traffic and noise, resulting in residents having greater difficulty hunting them.

Noise and human activity associated with construction of the MTI, which would occur during both the winter and summer seasons, could temporarily displace seals, periodically resulting in reduced harvest success for Nuiqsut seal hunters in the MTI area during the summer months. Vessel traffic between the MTI and Oliktok Point, which would occur throughout the open water season, may also cause temporary and periodic displacement of seals that could temporarily affect harvester success. The Project would require a total of nine sealift barges over the course of two delivery seasons; support vessel traffic would be much higher (an estimated 265 support vessels over the course of three open-water seasons). The presence of the MTI could also affect the distribution of marine mammals within the immediate area of the island (Willow MDP Supplemental EIS Section 3.13, *Marine Mammals*). However, noise and infrastructure related to MTI construction would not be likely to cause overall impacts to resource availability as most displacement would be temporary and localized; other suitable seal habitat would be available nearby, and residents would likely avoid areas where immediate disturbance is likely (e.g., around barges, support vessels, and the MTI during times of high activity) (Willow MDP Supplemental EIS Section 3.13). Noise and human activity at the MTI may also affect the availability of caribou along the coast during the summer; however, as discussed above, use of the coastal area in Harrison Bay has been limited in recent years due to access difficulties. Between 2008 and 2019, the Coastal West area has accounted for between zero and 2% of the total harvest (SRB&A 2021); thus, disruptions to caribou in this area would not likely affect overall resource availability for the Nuiqsut.

The Project would require additional fixed-wing aircraft and helicopter traffic to support module delivery Option 1. Most of this traffic would occur between Alpine and Willow. Potential impacts to resource availability related to air traffic are discussed in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*).

Access to Subsistence Resources

Potential impacts to harvester access are discussed in Willow MDP Supplemental EIS Section 3.16. Subsistence users would likely be prohibited from accessing the MTI area while it is under construction and operational, and the MTI would likely remain a gravel barrier island after decommissioning. Changes to coastal areas resulting from erosion and sedimentation around Atigaru Point is a key concern voiced by Nuiqsut residents who already have reported difficulty accessing nearshore areas in Harrison Bay in recent years. If construction of the MTI does contribute to the increasingly shallow waters in Harrison Bay, then it could further decrease access to coastal hunting areas. Long-term impacts to access would occur if construction of the MTI results in sedimentation or

ocean floor changes that affect access to coastal and nearshore areas; however, the MTI is not expected to cause additional sedimentation or shoaling (Willow MDP Supplemental EIS Section 3.16). Some individuals may use the MTI after it is decommissioned as a stopover point when hunting in Harrison Bay, similar to their use of other islands such as Thetis Island; however, it is unknown how accessible the island would be by boat.

Gravel haul ice roads associated with MTI construction would prohibit local use. Module transport ice roads would be restricted during periods of heavy use but would be available for local use during other times. Thus, some Nuiqsut furbearer, caribou, and goose hunters traveling overland by snow machine would likely experience reduced access during the winter and spring months when crossing through areas with ice roads. The gravel haul ice road between the MTI and the Tiŋmiaqsiuġvik gravel mine site would bisect high overlapping use areas for goose on Fish Creek. Thus, residents would likely experience reduced access to a portion of their goose hunting areas when ice roads continue to be operational in April. Impacts to access resulting from ice roads would only occur during the construction phase of the Project.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 1 (Atigaru Point Module Transfer Island), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction on subsistence uses for communities in or near the Project area.

7. Evaluation and Finding for Module Delivery Option 2 (Point Lonely Module Transfer Island)

Module delivery Option 2 (Point Lonely Module Transfer Island) would locate the MTI at Point Lonely, a substantial distance west of Atigaru Point. Option 2 would also include module transport and gravel haul ice roads, but they would extend from the Tiŋmiaqsiuġvik gravel mine site and WPF to Point Lonely. This alternative would locate the MTI away from Harrison Bay, a key marine hunting area for Nuiqsut.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 2 on subsistence would be like those described for module delivery Option 1 with three important differences:

1. Option 2 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and coastal caribou hunting activities.
2. Option 2 would increase potential impacts to winter subsistence uses to Utqiaġvik furbearer harvesting and other activities around Teshekpuk Lake.
3. Option 2 would increase the area and likelihood of disturbance for TCH caribou.

For Nuiqsut, impacts related to ice roads would be similar to those described for Option 1, as they would terminate in the same Project area locations (i.e., WPF, mine site), would cross Fish Creek in a similar area, and would affect similar subsistence uses.

The location of the MTI at Point Lonely would move potential marine impacts out of an area of moderate to high marine subsistence use for Nuiqsut into an area of low to limited use for both Nuiqsut and Utqiaġvik (Willow MDP Supplemental EIS Section 3.16, *Subsistence and Sociocultural Systems*), thus reducing the likelihood of direct impacts on marine subsistence uses for either community. However, the gravel haul and module transport ice roads would extend farther west, along the east side of Teshekpuk Lake, and terminating to the north of Teshekpuk Lake at Point Lonely. Teshekpuk Lake is a traditional hunting ground for Nuiqsut and is still used by Nuiqsut hunters, particularly during the winter, and it is a key contemporary subsistence use area for many Utqiaġvik families and hunters year-round. In addition, the lands surrounding Teshekpuk Lake, including those to the north and east of the lake, are critical calving, post-calving, and insect relief habitats for TCH caribou. Ice roads associated with Option 2 would occur over a larger area, resulting in a greater area of disturbance for TCH

caribou. In addition, summer Project activities at Point Lonely and along the ice road route, including construction noise, litter clean up (known locally as stick picking), human presence, and air traffic, which would be somewhat higher under Option 2, could affect caribou during the calving and insect relief seasons. This increased disturbance could result in alterations to caribou distribution closer to Nuiqsut and increased disturbance of calving and migrating caribou.

While module delivery Options 1 and 2 would directly affect a similar percentage of Nuiqsut harvesters overall, Option 2 would affect a greater percentage of Utqiaġvik subsistence harvesters of wolf and wolverine (23%) and caribou (22%) (Willow MDP Supplemental EIS Table 3.16.11). The ice road would occur in areas of low to moderate overlapping use for wolf and wolverine for Utqiaġvik and could affect resource availability of furbearers for hunters in the vicinity of Teshekpuk Lake. However, these impacts would only occur for the length of ice road operations during MTI construction module hauling operations and would cause primarily indirect effects. The percentage of caribou harvesters using the analysis area for Option 2 was similar to Option 1, ranging from 33% to 72%; caribou harvests within the area ranged from 4% to 19% of the total harvest during individual study years (Willow MDP Supplemental EIS Table 3.16.12).

Overall, Option 2 would reduce direct impacts to Nuiqsut subsistence uses within Harrison Bay but would increase potential indirect impacts to caribou resource availability for Nuiqsut and Utqiaġvik and direct and indirect impacts to Utqiaġvik wolf and wolverine hunters. Under both options, the impacts would occur during the Project's construction phase. Direct impacts to key subsistence uses would be lower under Option 2 for Nuiqsut due to the decreased impacts to marine and coastal subsistence uses, with a slight increase in potential impacts to caribou availability and a slight increase in impacts to furbearer subsistence uses for Utqiaġvik.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 2 (Point Lonely Module Transfer Island), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.

8. Evaluation and Finding for Module Delivery Option 3 (Colville River Crossing)

Module delivery Option 3 (Colville River Crossing), would not construct an MTI, instead relying on existing infrastructure at Oliktok Dock, as described under Alternative B. Similar to Options 1 and 2, Option 3 would include a module transport ice road, which would extend from the existing gravel road at Kuparuk drill site 2P (DS2P) to GMT-2, crossing the Colville River near Ocean Point (Figure 19). Some modifications to the existing Oliktok Road would be required to ensure an adequate turning radii for the module transporters; however, this area is not regularly used by contemporary Nuiqsut subsistence users. Option 3 would not require a separate gravel haul ice road from the mine site. Overall, Option 3 would make greater use of existing infrastructure but would cross through areas of heavy subsistence use to the south and southwest of the community.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 3 on subsistence would be like those described for module delivery Option 1 with four important differences:

1. Option 3 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and eider and coastal caribou hunting activities (Figure 20 and Figure 21).
2. Option 3 would have a greater potential for direct impacts to Nuiqsut winter subsistence uses due to placement of the module transport ice road in key subsistence harvesting areas to the south and west of the community.
3. Option 3 would reduce the intensity and frequency of impacts associated with ice road traffic because of the lack of a gravel haul ice road and overall reduction in traffic levels.

4. Option 3 would reduce infrastructure and activity within subsistence harvesting areas for Utqiaġvik, thus minimizing direct impacts to that community.

Unlike Options 1 and 2, Option 3 would not require the construction of a gravel nearshore island and would instead use existing infrastructure at Oliktok Dock. Because Oliktok Dock would be used under all action alternatives, regardless of module delivery option, potential impacts associated with the use of the dock are discussed under Alternatives B, C, and D. The use of existing nearshore infrastructure at Oliktok Dock for module delivery would reduce impacts to marine subsistence uses for Nuiqsut and Utqiaġvik.

For Nuiqsut, the types of impacts related to ice roads would be similar to those described for Option 1 and would terminate in the same Project area locations (i.e., WPF, mine site). However, under Option 3, the ice road would originate from the east, crossing through areas of high winter subsistence use for Nuiqsut near the Colville River to the south, southwest, and west of the community. Construction of the ice road under Option 3 would result in the community of Nuiqsut being completely encircled to the north, west, south, and east by gravel or ice roads for two winter seasons. This encirclement would occur over two winter seasons and would therefore be temporary. In addition, the impacts would be additive to existing infrastructure and traffic impacts along the North Slope Borough's Community Winter Access Trail, which provides access for North Slope residents to the Dalton Highway. While impacts of the Option 3 ice road would be additive to the Community Winter Access Trail, they would also be higher, as residents may be less likely to cross or use these roads due to their association with industrial development. Option 3 would affect a slightly higher percentage of Nuiqsut harvesters, primarily because the ice road crosses through areas of high overlapping use for the community, including along the Itkillik River, the Colville River, and overland to the south and southwest of the community. As noted above, part of the ice road would intersect with the Community Winter Access Trail and therefore impacts would be additive in those areas.

Peak hunting activities in those areas occur in the summer and fall when the ice roads and associated activities would not be present. However, while overall hunting activity is lower in the winter, the area surrounding the Option 3 ice road is used heavily by those who conduct winter hunting of wolf (96% of harvesters) and wolverine (96%) (Figure 22), and caribou (91%). Compared to Options 1 and 2, a higher percentage of Nuiqsut caribou harvesters used the Option 3 analysis area over 12 study years (between 64% and 94%), and a greater percentage of caribou harvests came from this area (between 5% and 21%) (Willow MDP Supplemental EIS Table 3.16.12). While the area where the ice road crosses the Colville River is heavily used by Nuiqsut moose hunters (94%), these activities occur in the fall when the ice road would not be present. The road would also cross through areas of moderate overlapping use for waterfowl in areas used by 45% of goose harvesters (Figure 23). However, few birds are present in the ice road area during winter (Willow MDP FEIS, Section 3.11) and hunting activity in April is limited (SRB&A 2010b); therefore, impacts are unlikely. The ice road crossing on the Colville River is upstream from key fish harvesting areas on the Niġliq and East channels of the river; however, the crossing is located far enough upstream from the CRD that it would minimize impacts to fish passage. Option 3 would require one less winter ice road season (two winters) compared to Options 1 and 2 (three winters). In addition, substantially less ground traffic would be required under Option 3; therefore, the ice road and associated traffic are less likely to deflect or disturb subsistence resources such as caribou and are less likely to deter subsistence harvesters from crossing. Impacts to furbearer hunting success resulting from traffic along the 2L ice road (close to the proposed Colville River ice road crossing) were reported by a Nuiqsut furbearer hunter during recent interviews in Nuiqsut (SRB&A 2022).

The ice road would overlap with the periphery of overland subsistence use areas for Utqiaġvik in areas of low overlapping use (Figure 24). In addition, the ice road would overlap with areas of moderate overlap for Utqiaġvik moose hunting; however, these moose hunting activities generally occur in summer or fall, when the ice road would be absent, and therefore impacts would be minimal. Compared to Option 1, Option 3 would affect a similar percentage of harvesters for wolf and wolverine (Figure 25), and a slightly higher percentage of caribou harvesters, in areas of low overlapping use. Impacts under Option 3 would occur for the length of ice road and module hauling operations, which would occur over the course of two winter seasons.

Overall, Option 3 would reduce direct impacts to Nuiqsut and Utqiaġvik coastal and marine subsistence uses. Option 3 could potentially affect a greater percentage of Nuiqsut wolf and wolverine and winter caribou harvesters; however, the frequency and intensity of impacts would be less due to the lack of a gravel haul road and decrease in associated traffic, as well as the reduction in ice road seasons from three to two.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 3 (Colville River Crossing), in combination with any of the action alternatives (B, C, D, or E) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.

Option 3: Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Kalikpik River
Fish Creek
Alt E BT2
BT2
Lake M0233
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Ublutuoch (Tiŋmiaqsiuġvik) River
GMT-2
Lake L9911
BT1
Fish Creek
Judy Ogaliapiks Creek
Lake M0015
BT3
Lake R0064
Ocean Point
Itkillik River
DS2P
Alt E BT5
Alt B, C, D BT5
0
5
10 Miles

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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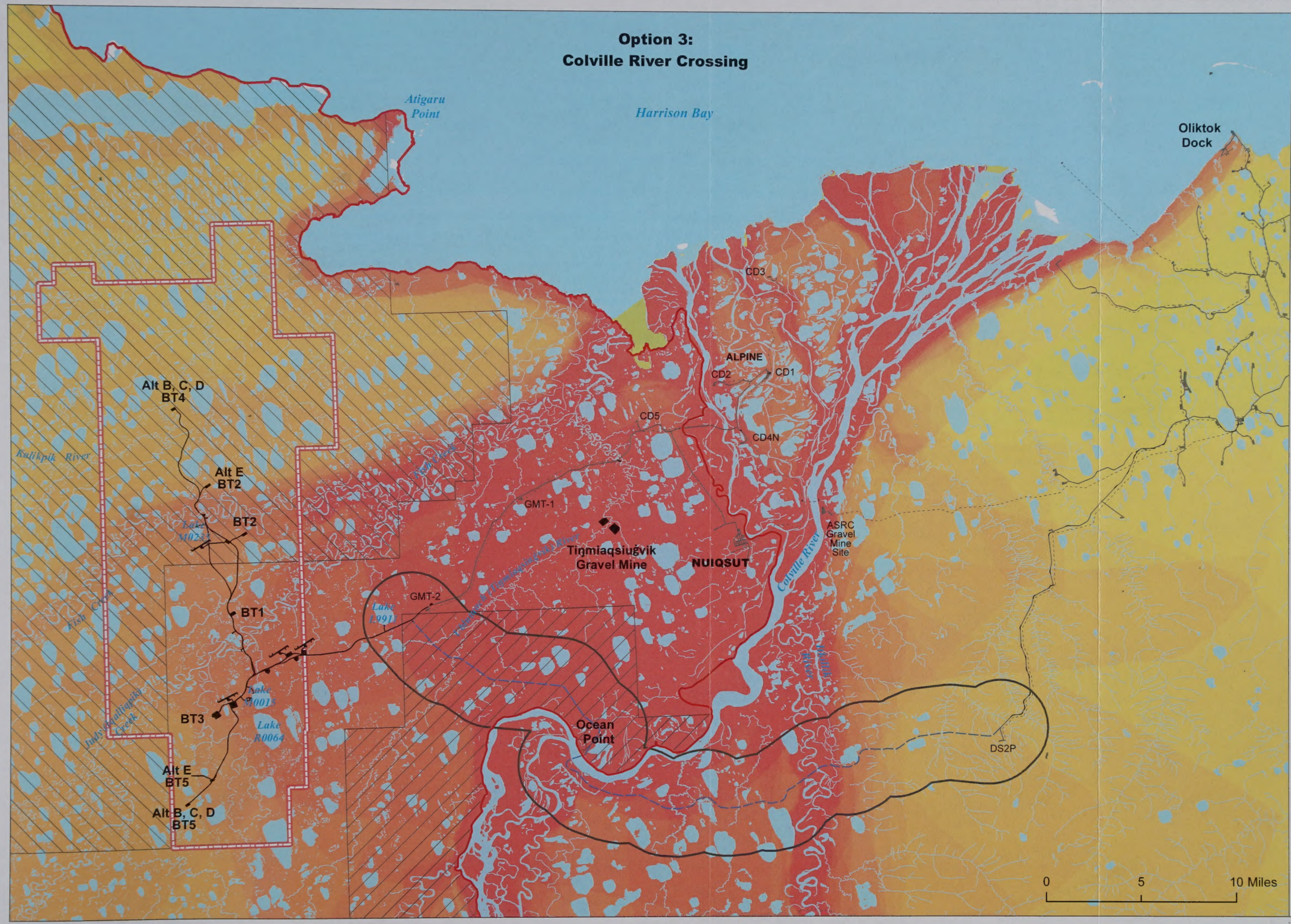
Figure 19

Caribou Subsistence Use Areas by Module Delivery Option 3, Nuiqsut, 1995 to 2006



Subsistence Data

- Overlapping Subsistence Use Areas Caribou, 1995-2006 [a] (High / Low)

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Oil and Gas Unit

- Bear Tooth Unit

NPR-A Special Areas

- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 20

Option 3: Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Kalikpik River
Alt E BT2
Fish Creek
BT2
Lake M0234
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Tiŋmiaqsiuġvik River
GMT-2
Lake L9911
BT1
Fish Creek
Lake M0015
Lake R0064
BT3
Judy Kraligipiky Creek
Ocean Point
DS2P
Alt E BT5
Alt B, C, D BT5
0
5
10 Miles

Subsistence Data
- High / Low — Overlapping Subsistence Use Areas Caribou, January 2008 through December 2019 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2021

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Figure 21

Option 3:
Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Kalikpik River
Alt E BT2
BT2
Lake M023
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
GMT-2
Lake L091
BT1
Lake M015
BT3
Lake M064
Ocean Point
DS2P
Alt E BT5
Alt B, C, D BT5
0
5
10 Miles

Subsistence Data
- Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a] (High / Low)

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 22

Option 3: Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Kalikpik River
Alt E BT2
BT2
Lake M0233
Fish Creek
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Ikkillik River
Fish Creek
BT1
GMT-2
Lake L9911
Ublutuoch (Tiŋmiaqsiuġvik) River
Judy Creek
Lake M0015
Lake R0064
BT3
Ocean Point
DS2P
Alt E BT5
Alt B, C, D BT5
0
5
10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Goose, 1995-2006 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 23

Option 3:
Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D
BT4
Kalikpik River
Fish Creek
Alt E
BT2
BT2
Lake M0233
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
Fish Creek
BT1
GMT-2
Lake L9911
Ublutuoch (Tiŋmiaqsiuġvik) River
Itkillik River
Lake R0015
Judy Creek
BT3
Lake R0064
Ocean Point
DS2P
Alt E
BT5
Alt B, C, D
BT5
0
5
10 Miles

Subsistence Data
- Overlapping Subsistence Use Areas Caribou, 1997-2006 [a] (High / Low)

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 24

Wolf and Wolverine Subsistence Use Areas by Module Delivery Option 3, Utqiaġvik (Barrow), 1997 to 2006

Option 3: Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
ALPINE
CD2
CD1
CD5
CD4N
Alt B, C, D BT4
Kuukpik River
Alt E BT2
BT2
Lake M0237
Fish Creek
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
ASRC Gravel Mine Site
Colville River
GMT-2
Lake L9911
Ublutuoch (Tiŋmiaqsiuġvik) River
Itkillik River
BT1
Lake M0015
Lake R0064
BT3
Judy Creek
Alt E BT5
Alt B, C, D BT5
Ocean Point
DS2P
0
5
10 Miles

Subsistence Data
- Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006 [a] (High / Low)

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Oil and Gas Unit
- Bear Tooth Unit

NPR-A Special Areas
- Colville River Special Area
- Teshekpuk Lake Special Area

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 25

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9. Evaluation and Finding for the Cumulative Case*

Willow MDP Supplemental EIS Section 3.19, *Cumulative Effects*, contains a description of the cumulative case, which evaluates the impacts of the proposed action in conjunction with past, present, and reasonably foreseeable future actions on subsistence. Reasonably foreseeable future actions considered in the cumulative analysis are provided in Willow Supplemental EIS Section 3.19 and include oil and gas exploration, pipeline and oil field development, and transportation projects. The cumulative impacts of climate change on subsistence are considered as part of the future condition on the North Slope.

Reasonably foreseeable oil development that could contribute to cumulative impacts on subsistence for Nuiqsut, Utqiaġvik, and other North Slope communities include continued development of Kuparuk and Prudhoe Bay, the Nanushuk Development, CPAI drill site 3T (formerly known as Nuna DS2), Liberty Development in the Beaufort Sea, state offshore lease sales and development, oil and gas leasing and development within the NPR-A, and the Alaska LNG or Alaska Stand Alone pipelines. In addition, BLM is currently developing an oil and gas leasing program in the Arctic National Wildlife Refuge, which could lead to oil and gas exploration and development in the 1002 (Coastal Plain) area. Development of offshore leases in federal waters is not projected to occur in the Chukchi Sea during the sealift operations for the Project, or within the foreseeable future. In the Beaufort Sea, Hilcorp is still pursuing its proposed Liberty project; however, the project schedule has been pushed back indefinitely until Hilcorp revises its oil spill response plan and reevaluates its development and production plan, at which time the Bureau of Ocean Energy Management (BOEM) would have to complete additional NEPA analysis before it could reapprove the project. Although BOEM is currently working on the next 5-year leasing program, BOEM's current 5-year leasing plan (ending 2022) does not allow for lease sales in either the Beaufort or Chukchi seas. With the exception of the proposed Liberty project and Northstar development (which has been in production for decades) to the east, almost all federal offshore leases in this area have been surrendered.

Other reasonably foreseeable transportation and infrastructure projects include airport and community infrastructure improvements; continued marine vessel and air traffic associated with shipping, development, scientific research, and recreation and tourism activities in the region; and new permanent or seasonal roads such as the Arctic Strategic Transportation and Resources Project, which could lead to development of roads linking North Slope communities to each other and ultimately the Dalton Highway.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs*

Cumulative effects on subsistence would be similar if Alternatives B, C, or E are selected in the ROD for the Project. If Alternative D is selected, cumulative effects would differ due to the lack of a year-round gravel access road. Construction of the Project without a year-round access road could substantially reduce displacement or deflection of TCH caribou but would result in somewhat higher disturbances related to air traffic and would not provide year-round subsistence access. The module delivery options would not contribute substantially to the cumulative case as most associated activities would occur solely during construction. While Option 1 would have greater overall direct impacts to Nuiqsut marine and coastal subsistence uses, most of these impacts would cease after the construction phase ended.

Regardless of the alternative selected, cumulative oil and gas activity, transportation projects, and climate change will increasingly restrict subsistence uses and affect the availability of subsistence resources such as caribou and marine mammals. This analysis focuses in part on the impacts that would be associated with an access road to the Project (Alternatives B, C, and E) and assumes access roads to any future development west or south of the Willow development in the NPR-A. For the disconnected access road scenario (Alternative D), impacts from access roads as described below would not accumulate from development of the Project, though they may accumulate from other transportation projects in the region. Impacts related to air traffic would accumulate, to a greater degree, under Alternative D because of the slight increase in air traffic required to reach the Project area during the snow-free months.

Since 2000, oil and gas exploration and development has expanded into Nuiqsut's core subsistence use areas, including the CRD (Alpine drill sites CD1 through CD4) and to the north and west of the community toward Fish Creek (Alpine drill site CD5, GMT-1, and GMT-2). As a result, the frequency of conflicts between subsistence and development activities have increased (SRB&A 2019a). The Project, in addition to other reasonably foreseeable future activities such as the Nanushuk development, would contribute to the cumulative effects of development on subsistence resources and activities because it would represent a net increase in the amount of

land used for oil and gas and other development, in addition to a related increase in industrial activity, including air traffic.

The Alpine CD5, GMT-1, and GMT-2 development projects are present actions that are most closely connected to proposed development in the BTU. These developments were facilitated by previous developments, including Alpine CD5 (for GMT-1) and GMT-1 (for GMT-2). Alpine CD5 was the first major oil and gas development west of the CRD and is connected to Alpine via a bridge and road. Development of Project drill sites, particularly in the case of a year-round access road, would likely facilitate future development to the west and southwest of Nuiqsut within the NPR-A. Development of these drill sites, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community. Despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off-limits to subsistence uses despite being considered part of the community's traditional use area (SRB&A 2018b). Development of the Pikka (formerly Nanushuk) project would introduce infrastructure directly to the east of the CRD in an area used for harvesting of caribou, seal, eider, and fish (e.g., Arctic grayling) and leave only the southerly direction untouched by oil and gas infrastructure. Despite the current lack of infrastructure to the south, oil and gas exploration has occurred to the south of the community and may result in oil and gas development in the future. There is potential to further expand the existing Alpine oilfield through the development of CD8, which would be located south of Nuiqsut, including a gravel road and pipeline connection to CD4. Activities to the south of Nuiqsut could affect hunting of caribou, moose, and furbearers, as well as fishing activities along the river. Finally, development of the BTU would introduce a major oil and gas development within Utqiaġvik's hunting area, although Project development would be located at the eastern edge of the subsistence use area for the community, within an area that provides a minimal amount of subsistence resources compared to land north and west of Teshekpuk Lake. Development of the BTU could lead to additional future development in the BTU, including development of the West Willow discovery, and elsewhere in the NPR-A that is within the core harvesting areas for Utqiaġvik and Atqasuk, thus increasing the potential for direct impacts to subsistence users from other communities. In addition to new developments, upgrades, expansions, and maintenance activities will be ongoing throughout the life of various existing developments. These could include a 5-acre K-Pad expansion and a new 15 to 30-acre gravel staging pad in the GMT unit.

In addition to the additive effects of increasing oil and gas infrastructure in the region, increased activity, including oil and gas exploration and seismic activity, air traffic, scientific research, recreation, and sport hunting and fishing activities, would also contribute to subsistence impacts by increasing the frequency of noise and air traffic disturbances, and interactions with non-local researchers, workers, and recreationists. Increased noise disturbances would contribute to existing impacts on subsistence resource availability. Ongoing disturbances within the NPR-A, in combination with the Project, would likely contribute to changes in the availability of caribou within Nuiqsut's harvesting area.

Barges and vessel traffic associated with the Project would be additive to shipping and scientific research in the Beaufort and Chukchi seas. Vessel traffic would be required for 4 years of the Project's construction phase to transport the modules needed to construct Project infrastructure, and cumulative vessel traffic during this time period would have relatively minimal impacts on marine mammal availability (see Figure 17 for Nuiqsut seal use areas, and Willow MDP Supplemental EIS Appendix E, Figures E.16.9 and E.16.20 for Nuiqsut and Utqiaġvik marine mammal use areas). Development of offshore leases in federal waters is not projected to occur in the Chukchi Sea during the sealift operations for the Project, or within the foreseeable future. In the Beaufort Sea, Hilcorp is still pursuing its proposed Liberty project, however the project schedule has been pushed back indefinitely until Hilcorp revises its oil spill response plan and reevaluates its development and production plan, at which time BOEM would have to complete additional NEPA analysis before it could reapprove the project. Though BOEM is currently working on the next 5-year leasing program, their current 5-year leasing plan (ending 2022) does not allow for the possibility of lease sales in either the Beaufort or Chukchi seas. With the exception of the proposed Liberty project and Northstar development (which has been in production for decades) to the east, almost all federal offshore leases in this area have been surrendered. The 2021 Conflict Avoidance Agreement (CAA) between whalers and oil and gas operators has been effective at reducing impacts to subsistence hunting of marine mammals. The CAA stipulates that all vessel routes should be planned so as to minimize potential conflicts with bowhead whales or subsistence whaling; in some areas, vessels are required to remain as far offshore as weather and ice conditions allow, and at least five miles offshore during transit. It is unlikely that transport of Project modules, normal shipping patterns, and the construction of the Liberty project would

cumulatively cause a significant restriction to marine mammal harvesters on the North Slope in the absence of significant offshore oil and gas exploration and development.

Competition with non-local hunters would contribute to subsistence impacts by potentially decreasing harvest success rates for local subsistence users. Nuiqsut hunters have reported concerns associated with sport hunters along the Dalton Highway and the impacts of those hunters on the movement of caribou toward the community's hunting grounds. In addition, impacts from guided sport hunts to the south of Nuiqsut near Umiat and closer to the foothills of the Brooks Range have been reported by residents of both Nuiqsut and Anaktuvuk Pass (SRB&A 2013c, 2019b). Data from the Alaska Department of Fish and Game (ADF&G) harvest ticket database, which captures primarily non-local harvests (until 2017, state residents north of the Yukon River did not have to use a harvest ticket, and it is presumed that local harvest reports with these permits are low) (Braem 2014), show approximately 16,000 caribou harvested within Game Management Units (GMUs) 26A and 26B between 2000 and 2020 (Table 1). Approximately 87% of these harvests occurred within GMU 26B, which extends to the east of the Colville River and includes the Dalton Highway. The vast majority of harvests within Unit 26B were reported to be CAH caribou. In Unit 26A, where the proposed Willow development area is located, nearly all harvests were reported to be Western Arctic Herd (WAH) caribou (ADF&G 2022). Data by smaller uniform coding unit for Unit 26A indicate that the majority of non-local harvests occur to the south of Umiat and near the Brooks Range (Braem 2014). Harvests of TCH caribou by non-residents are thought to be minimal due to difficulty accessing their central range near Teshekpuk Lake (Braem 2014). Based on available data, non-local harvests within Unit 26B have decreased somewhat in recent years, while harvests in Unit 26A have remained relatively stable.

Table 1. Caribou Harvests by Study Year in Game Management Sub-units 26A and 26B*

Harvest Year	Number Harvested 26A	Number Harvested 26B	Total Number Harvested
2000	68	493	561
2001	57	510	567
2002	79	413	492
2003	117	397	514
2004	115	625	740
2005	87	670	757
2006	91	831	922
2007	114	665	779
2008	94	716	810
2009	75	803	878
2010	65	1,212	1,277
2011	84	1,162	1,246
2012	95	1,003	1,098
2013	95	865	960
2014	121	915	1,036
2015	121	763	884
2016	163	588	751
2017*	156	232	388
2018*	110	224	334
2019*	118	300	418
2020*	89	427	516
All Years	**2,114**	**13,814**	**15,928**

Source: (ADF&G 2022)

* Starting in 2017, ADF&G required all state residents, including local residents, to use a registration permit. Prior to 2017, residents north of the Yukon River were not required to submit a harvest ticket. It is presumed that harvest reporting by local residents from 2017 to 2020 is low; however, a small number of the 2017–2020 reported harvest may be from local subsistence users.

Data on Special Recreation Permits from BLM for guided hunts in Unit 16A show three guide services operating during the 2017–2021 time period. One guiding service operated in the Umiat/Colville River area, taking between 8 and 56 flights and harvesting between 9 and 38 caribou annually. Hunting trips and harvests in the Colville River/Umiat areas were on the high end in 2020 and 2021, as were user days. Other guide services operated farther west and south, in the Nigu and Etivluk river drainages. Overall, hunting guides on BLM land in Unit 16A took 141 caribou during the 2017–2021 time period.

Competition with non-local hunters may contribute to impacts on local subsistence users if there is a decrease in the abundance of caribou or if caribou are deflected from traditional hunting grounds. While CAH caribou generally do not occur within the Willow development area, they do occur to the east of the Colville River and are harvested by Nuiqsut residents. If TCH caribou experience a decline or become more difficult to harvest due to changes in their distribution or behavior, then Nuiqsut residents may shift their focus to the CAH, thus increasing the likelihood of competition with non-local users. Similarly, other North Slope communities that hunt from the TCH (e.g., Utqiaġvik, Atqasuk, Anaktuvuk Pass, Wainwright) may increase their harvests from other herds (e.g., the WAH) if the availability of TCH caribou declines. If the population of the WAH also continues to decline, as it has in recent years (Hansen 2021), this could increase competition for caribou across multiple communities with non-local users.

Development activities and infrastructure can change hunting patterns and use areas over time by introducing barriers, impediments, or restrictions to access; by facilitating access to lesser used hunting areas via roads; or by causing changes to the availability of subsistence resources in the vicinity of development. Nuiqsut's core subsistence use area has shifted west over time due to Prudhoe Bay development, and recent research has documented decreased use of traditional use areas, including the Niġliq Channel, in part due to development activities and infrastructure (SRB&A 2019a).

Decreased use areas in some development areas have occurred while road-accessible areas have seen increased use. The Kuukpik Spur Road was constructed in 2014 and 2015 to facilitate access for Nuiqsut hunters to the Alpine development's roads. The road has provided access to residents, and the road system has seen increased use in every year since its construction. In 2018 and 2019, harvests of caribou within 2.5 miles of Alpine-related infrastructure were on the high end of all previous study years (SRB&A 2021). Some hunters indicate that their use of the road system offsets decreased harvests closer to the community, which they believe are a result of deflection from the road itself (SRB&A 2018a). Thus, facilitated access to hunting areas via roads is a countervailing effect that partially mitigates the impacts of roads and associated development on subsistence resource availability; this benefit is particularly prevalent for hunters who are less active, do not have access to other non-road modes of transportation (e.g., snow machines, ATVs), or have limited time to spend harvesting resources. However, use has also increased among active hunters who have access to various modes of transportation. Similar to the Spur Road, the recently built Colville River Access Road provides increased access to the upriver hunting areas along the Colville River and away from the area of development, which could also help to offset impacts resulting from increased development infrastructure to the north and west of the community. In recent years, access to the main channel of the Colville River has been difficult due to shallow river channels. During recent interviews in Nuiqsut, residents also reported using the road itself to hunt caribou (SRB&A 2021).

Increased development infrastructure on the North Slope would continue to cause alteration and degradation of habitats for key subsistence resources including caribou, furbearers, fish, and goose. Over time, these changes could affect the health and abundance of different subsistence resources on the North Slope. Risks of oil spills and contamination associated with increased development infrastructure and activity could result in increased avoidance of subsistence foods due to concerns about contaminated food sources. This may be more likely to occur with fish resources downstream from potential contamination sites but could also occur with terrestrial mammals, marine mammals, and bird resources. Avoidance of subsistence foods could have sociocultural effects by reducing food security and reducing opportunities to engage in the distribution (sharing), processing, and consumption of subsistence foods. If development were to continue westward into the core calving area for the TCH, or if it reduced access to key insect relief habitats, then the herd could experience an overall decline in productivity and abundance. Under this scenario, impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd including Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright. However, under BLM's 2022 ROD for the NPR-A IAP/EIS, BLM selected Alternative A which prohibits new oil and gas leasing and new infrastructure associated with oil and gas development within the core calving area for the TCH, important insect relief habitat north of Teshekpuk Lake, and key migration corridors around Teshekpuk Lake. As such, an overall decline in productivity and abundance is not expected.

The cumulative effects of current and future activities related to restrictions on access to traditional areas, changes in hunting patterns, and reduced resource abundance and availability are likely to continue as long as oil and gas exploration and development continues on the North Slope.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the cumulative case is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the cumulative case is identical to that provided above in Section B.2.c.

d. Findings*

1. **Reductions in the availability of subsistence resources described above for the cumulative case may significantly restrict subsistence uses of caribou and furbearers for the community of Nuiqsut.**

2. **Limitations on subsistence user access described above for the cumulative case may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that the cumulative case is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

Other development projects near the proposed Project in the BTU, specifically GMT-1 and GMT-2, previously included findings of "may significantly restrict" for additional communities under the Cumulative Case (BLM 2014, 2015). The Section 810 Analysis for GMT-1 concluded that the effects of the Cumulative Case "when taken in conjunction with all alternatives, fall above the level of significantly restricting subsistence use for the communities of Nuiqsut, [Utqiaġvik], Atqasuk, Anaktuvuk Pass, Point Lay, and Wainwright" (BLM 2014, Appendix L). The Section ANILCA Section 810 Analysis for GMT-2 concluded that the Cumulative Case "may result in a significant restriction to subsistence uses for the communities of Utqiaġvik, Atqasuk, and Anaktuvuk Pass due to impacts to terrestrial and marine subsistence resources and access" (BLM 2015, Appendix L). These findings were primarily based on anticipated impacts from additional federal and state offshore lease development in the Chukchi and Beaufort Seas and associated onshore development. Such developments could cause a synergistic increase in disturbances to resources, especially to marine species important to subsistence uses for the communities of Utqiaġvik, Point Lay, Wainwright, and Atqasuk. Additional onshore facilities to support offshore developments (e.g., pipelines, processing facilities) could impact terrestrial species including caribou and furbearers.

As noted above, development of offshore leases in federal waters in the Chukchi Sea is not projected to occur during sealift operations for the Project or within the foreseeable future. Hilcorp continues to pursue its proposed Liberty Project; however, the project schedule has been pushed back indefinitely until Hilcorp revises its oil spill response plan and reevaluates its development and production plan and until such time as BOEM can complete additional NEPA analysis. BOEM's current 5-year leasing plan (ending 2022) does not allow for lease sales in either the Beaufort or Chukchi seas. As such, the potential for impacts from offshore development and associated onshore development are reduced under the current analysis and therefore no finding of significant restriction is made for communities other than Nuiqsut. Rationale for these findings is included below.

1. The Rationale for the Findings of Reduction in the Availability of Subsistence Resources Under the Cumulative Case*

The GMT-1, GMT-2, and Alpine CD5 development projects are present actions that are most closely connected to the proposed Project in the BTU. Impacts from these actions are localized to the area around Nuiqsut. Development of the Project, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community that alter the traditional distribution of caribou within the Nuiqsut core subsistence use area. Additionally, despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off limits to subsistence uses despite being considered part of the Nuiqsut's traditional use area.

BLM concludes that altered distributions of TCH caribou and furbearers that are likely to occur during construction and operation of the Project, together with the existing GMT and Alpine developments and reasonably foreseeable developments within onshore NPR-A leases and on state land could cause a major redistribution of resources within the Nuiqsut core subsistence areas that would affect these resources for Nuiqsut hunters.

2. The Rationale for Findings of Limitations on Subsistence User Access Under the Cumulative Case

Nuiqsut's core subsistence use area has shifted west over time due to the development in Prudhoe Bay and recent research has documented decreased use of traditional use areas, including the Niġliq Channel, in part due to development activities and infrastructure (SRB&A 2019b). This shift, together with impacts anticipated to occur from development of the Project (described under Alternatives B, C, D, and E and Module Delivery Options 1, 2, and 3), BLM expects that limitations to subsistence access and the reduced resource availability attributable to development of the Project, would result in an extensive interference with Nuiqsut hunter access.

C. NOTICE AND HEARING*

ANILCA Section 810(a) provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Sections 810(a)(1) and (2). BLM provided notice in the *Federal Register* that it made positive findings pursuant to ANILCA Section 810 that Alternatives B, C, D, and E and the cumulative case presented in the Willow MDP Draft Supplemental EIS met the "may significantly restrict" threshold. As a result, public hearings were held in the potentially affected community of Nuiqsut in order to solicit public comments from the potentially affected community and subsistence users. Notice of these hearings were provided in the *Federal Register* and by way of the local media, including the Arctic Sounder newspaper, and KBRW, the local Utqiaġvik radio station with coverage to all villages on the North Slope. Meeting dates and times were posted on BLM's website at www.blm.gov/alaska. The public hearing was held in-person.

D. SUBSISTENCE DETERMINATIONS UNDER THE ANILCA SECTIONS 810(A)(3)(A), (B), AND (C)*

[DETERMINATIONS WILL BE MADE AVAILABLE IN THE WILLOW MDP RECORD OF DECISION]

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Willow Master Development Plan

Appendix H
Spill Summary, Prevention, and Response Planning

January 2023

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List of Acronyms

ADEC	Alaska Department of Environmental Conservation
BLM	Bureau of Land Management
CPAI	ConocoPhillips Alaska, Inc.
EPA	U.S. Environmental Protection Agency
FLIR	forward-looking infrared
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
LS	lease stipulations
MDP	Master Development Plan
NPR-A	National Petroleum Reserve in Alaska
ODPCP	Oil Discharge Prevention and Contingency Plan
Project	Willow Master Development Plan Project
ROD	Record of Decision
ROP	Required Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure

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1.0 SPILL SUMMARY

Table H.1.1 summarizes drilling and operations spill types, spill volumes, spill likelihood, spill duration, and estimated geographic extent of spill for the action alternatives.

Table H.1.1. Potential Spill Types, Spill Volumes, Spill Likelihood, Spill Duration, and Estimated Geographic Extent of Spill during the Drilling and Operations Phases for Action Alternatives

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Oil wells	Shallow gas blowout	Drilling fluids (no produced fluids)	VL	VL	VL	VL	VL	VL	1 to 2 days	No crude oil would be spilled, but drilling muds and other drilling fluids could impact an area up to 20 to 25 acres adjacent to the well pad.
Oil wells	Reservoir blowout	Produced fluids and drilling fluids	VL	VL	VL	VL	VL	VL	A few days to a week or two	Modeling results suggest that up to 10% of the discharged oil would remain airborne as an aerosol and 90% would be expected to reach the ground surface in a swath up to 2,953 feet wide and up to 22,310 feet downwind of the well based on typical prevailing wind patterns at the time of the spill. (Details are in Section 4.3, *Potential Spills during Drilling and Operations*.)
Oil wells	Wellhead and well-casing leaks	Produced fluids	L	L	L	VL	VL	VL	A few hours for very small spills to a few days for large spills	Spills would be expected to be contained within the immediate vicinity of the well itself and would not be expected to reach areas off the gravel pad.
Pipelines	Facility piping	Produced fluids and various refined products	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills	Spills would be expected to be contained to the gravel pad and its immediate margin.
Pipelines	Infield flowlines	Multiphase produced fluids and produced water	L	L	L	VL	VL	VL	Very short (less than 4 hours) or could continue for days to weeks depending on the size and location of the leak along the flowline	Leaks could occur on gravel pads or on tundra and adjacent waterbodies between pads. Large spills that go undetected for a period of time could spread to an area a few acres in size before the spill is stopped. The area reached by materials from large spills would be influenced by the location and time of year of the spill. If a large spill were to occur in the vicinity of a river or during the spring when water flows are high, the geographic extent of such a spill could be larger.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Pipelines	Process piping	Processed (sales-quality) oil	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills before the leak is repaired	Process piping associated with well manifolds and processing at the WPF would be expected to be contained to the gravel pad or its immediate margin, with very little reaching adjacent areas. The area reached by large spills would be influenced by the location and time of year the spill occurred.
Pipelines	Export pipeline	Processed (sales-quality) oil and make-up water (seawater)	VL	VL	VL	VL	VL	VL	Very short (less than 1 hour) or could continue for days to weeks before being detected depending on the size and location of the leak along the pipeline corridor	Leaks could occur on the WPF gravel pad or at the tie-in gravel pad at Alpine CD4N or on tundra and adjacent waterbodies between pads. Very small spills would be expected to be limited to a small area in the immediate vicinity of the spill; however, larger spills that go undetected for a period of time could extend to an area several acres in size before being stopped. The spill's location and the time of year also influence the extent of the spill. For instance, if a large or very large spill were to occur in the vicinity of a river, the geographic extent of such a spill could be much higher.
Aboveground storage tanks	Large aboveground storage tanks	Various refined products and processed (sales-quality) oil	L	L	L	L	VL	VL	Would likely be noticed within a day of the start of the leak, but securing the leak could take a few days depending on where the leak occurred on the tank	Spilled material would be captured within secondary containment. In the unlikely event that a spill escaped the secondary containment, it is expected that the spill would be contained to the pad itself and would not reach the tundra, adjacent waterbodies, or other sensitive habitats.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)a	Small Oil Spill Classification (10 to 99.9 gallons)a	Medium Oil Spill Classification (100 to 999.9 gallons)a	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)a	Large Oil Spill Classification (10,000 to 100,000 gallons)a	Very Large Oil Spill Classification (> 100,000 gallons)a	Likely Duration of Spill	Likely Geographic Extent of Spill
Spills not specifically associated with petroleum development infrastructure	Spills associated with warehouse activities; storage facilities; equipment maintenance and repair activities; vehicle accidents; and vehicle and equipment refueling activities	Typically, a variety of refined products	VH	VH	H	L	VL	VL	On-pad spills would be observed and responded to quickly and be of short duration (less than 0.5 day). Spills from vehicle accidents would happen at the time of the accident and last less than an hour.	Spills would remain on the pad or within secondary containment; damage to areas adjacent to pads would not be anticipated. If a spill occurred due to a large bulk-fuel tanker truck accident and the tanker volume was released, the geographic extent would likely include the road, adjacent roadside habitats, and possibly waterbodies. The geographic extent of a spill of this size would vary depending location of the accident and the season in which it occurred; however, the spill would be localized and likely affect an area up to 0.5 acre in size.

Note: H (high); L (low); M (medium); VH (very high); VL (very low); WPF (Willow processing facility).
[a] Oil spill size classifications denote the likelihood of a spill or release occurring.

2.0 SPILL PREVENTION AND RESPONSE PLANNING

As described in Chapter 4.0, *Spill Risk Assessment*, ConocoPhillips Alaska, Inc. (CPAI) would implement numerous spill prevention and response planning measures as part of the Willow Master Development Plan Project (Project) to help prevent spills and minimize damage to human health and the environment in the unlikely event they occur. Spill prevention measures include the following:

- Specific design features to detect and contain leaks
- Adherence to required operating procedures (ROPs) and lease stipulations (LS)
- Systems to notify operators of potential leaks
- Procedures to maintain the pipelines and other infrastructure

Response planning measures include the following:

- Developing numerous response planning documents for a variety of spill scenarios
- Providing necessary equipment to prevent and respond to spills
- Ensuring personnel are trained and knowledgeable about the procedures to respond efficiently and effectively to oil spills and other accidental releases

Project facilities would be designed to mitigate spills with spill prevention measures and spill response capabilities. CPAI would implement a pipeline maintenance and inspection program and an employee spill prevention training program to further reduce the likelihood of spills occurring. CPAI's design of production facilities would include provisions for secondary containment of hydrocarbon-based and other hazardous materials, as required by state and federal regulations. If a spill occurs on a gravel or ice pad, the fluid would remain on the pad unless the spill is near a pad edge or exceeds the pad's retention capacity. Fuel transfers near pad edges would be limited to the extent practicable to mitigate this risk. In addition to regulations governing spill prevention and response, the Project would be managed under the BLM LS and ROPs described for solid waste, fuel, and chemical storage (BLM 2022) (Section 2.5, *Applicable Lease Stipulations and Best Management Practices*).

2.1 Spill Prevention

Spill prevention and response measures that would be used during construction, drilling, and operations would be outlined in the Project's Oil Discharge, Pollution, and Contingency Plan (ODPCP) and the Spill Prevention Control and Countermeasures (SPCC) Plan. The intent of the ODPCP and SPCC Plan is to demonstrate CPAI's capability to prevent oil spills from entering the water or land and to ensure rapid response in the event a spill occurs. The ODPCP would comply with applicable State of Alaska requirements (AS 46.04.030, 18 AAC 75) for spill prevention and federal U.S. Environmental Protection Agency (EPA) regulations in 40 CFR 112, D (Facility Response Plans). The SPCC Plan would comply with the federal EPA regulations contained in 40 CFR 112.

CPAI would design and construct pipelines to comply with state, federal, and local regulations. Pipelines would be constructed of high-strength steel and would have wall thicknesses in compliance with or exceeding design code regulatory requirements. Pipeline welds would be validated using nondestructive examination (i.e., radiography or ultrasonic) during pipeline construction to ensure their integrity and pipelines would be hydrostatically tested prior to operation. The production fluids, water injection, seawater, and export pipelines would be fully capable of accommodating pigs for cleaning and corrosion inspection.

CPAI would use two methods of leak detection for the seawater and diesel pipeline horizontal directional drilling (HDD) crossings under the Colville River: leak detection by mass balance (primary) and optical leak detection (secondary and within the pipeline carrier casing). To further prevent a pipeline leak under the Colville River, the diesel and seawater pipelines would be installed inside high-strength casing pipe. Simultaneous failure of both the pipeline and the associated casing is highly unlikely. If diesel or seawater leaked from the pipelines, it would be contained within the space between the outer walls of the pipelines and the inner wall of the casing rather than reaching the subsurface river environment. The design is analogous to secondary containment provided as a spill prevention technique for storage tanks. The casing would perform a second function: accommodating the external loads that would normally be carried by the pipeline. The casing and pipelines would not apply significant, direct loads onto each other, with some load transferred by the plastic casing isolators attached to the carrier pipeline. A deformation of the casing pipe would not necessarily cause deformation of the carrier pipelines, thus providing protection against external loads. To prevent external corrosion, the casing and pipelines would be protected by an abrasion-resistant coating, in accordance with industry standards.

There would be an increased potential for pipeline spills where pipelines cross under roads due to corrosion of the buried portion of the pipelines. The likelihood of corrosion occurring would be reduced through design and monitoring. CPAI would maintain corrosion control and inspection programs that include ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss deflection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared technology. The inspection programs are API Standard 570–based programs that focus inspection efforts on areas with the greatest potential for spills.

2.2 Spill Response

CPAI would implement the Project's ODPCP and SPCC Plan to minimize accidental oil spills and associated impacts. Through the ODCP, CPAI would demonstrate that readily accessible inventories of fit-for-purpose oil spill response equipment and personnel would be available for use at Project facilities. In addition, a state-registered primary response action contractor would serve as CPAI's primary response action contractor and would provide trained personnel to manage all stages of a spill response, including containment, recovery, and cleanup.

The threat to rivers and streams from a possible pipeline spill would be minimized by quickly intercepting, containing, and recovering spilled oil near the waterway-pipeline crossing points. The road would be used for access and staging for spill response. Valves would be installed on each side of pipeline crossings at Fish Creek and Judy (Iqalliqpik) Creek, which would allow isolation of produced fluids pipelines on either side of the bridges to minimize potential spill impacts in the event of a leak or break.

Spill response equipment would be pre-staged at strategic locations across the Project area as outlined in the ODPCP for an initial response. This strategy would facilitate the rapid deployment of equipment by personnel. The effective response time would be enhanced with pre-staged equipment, which would expedite equipment deployment to contain and recover spilled oil, reducing the overall affected area. During summer, pre-staged containment booms would be placed at strategic locations near selected river channels to facilitate a rapid response. Pre-deployed booms may also be placed within selected stream channels to mitigate a spill, should one occur. During summer, spill containment equipment would likely be staged or deployed using helicopters. If a spill occurs, spill response activity could include watercraft (e.g., airboats, jetboats) use to access affected areas.

2.2.1 Pre-Staged and Pre-Deployed Equipment

Dedicated oil spill response equipment (e.g., boom, anchors, skimmers, hoses, pumps, portable storage) would be pre-staged and stored in connexes at dedicated storage locations near the pipelines and HDD crossing of the Colville River. Pre-staged equipment would be placed in close proximity to facilities and infrastructure, and in areas that are easily accessible, allowing for quick deployment. This includes equipment pre-staged along the east bank of the Colville River, just north of the existing Alpine HDD pipeline crossing (CPAI 2018).

Spill response team personnel may also pre-deploy diversionary or exclusion booms in the rivers each summer, including in the Colville River. Specific boom-laying configurations, and the exact footage lengths of booms pre-staged at each site may vary in response to seasonal changes in the river channel and weather-driven fluctuations in the river currents. At each pre-staging site, boom sections and anchors would be staged on the shoreline in a manner that optimizes the boom's intended use for containment and recovery. Response equipment would be maintained in such a manner that it could be deployed rapidly and in a condition for immediate use. CPAI would routinely inspect and test on-site response equipment. CPAI's spill response contractor would also perform routine inspection and maintenance of all response equipment.

CPAI currently pre-stages and pre-deploys equipment throughout the Alpine and Greater Mooses Tooth developments (Figure H.2.1), including spill response equipment and pre-deployed boom. Figure H.2.1 also reflects general planned locations for pre-staged and pre-deployed spill response equipment (CPAI 2020).

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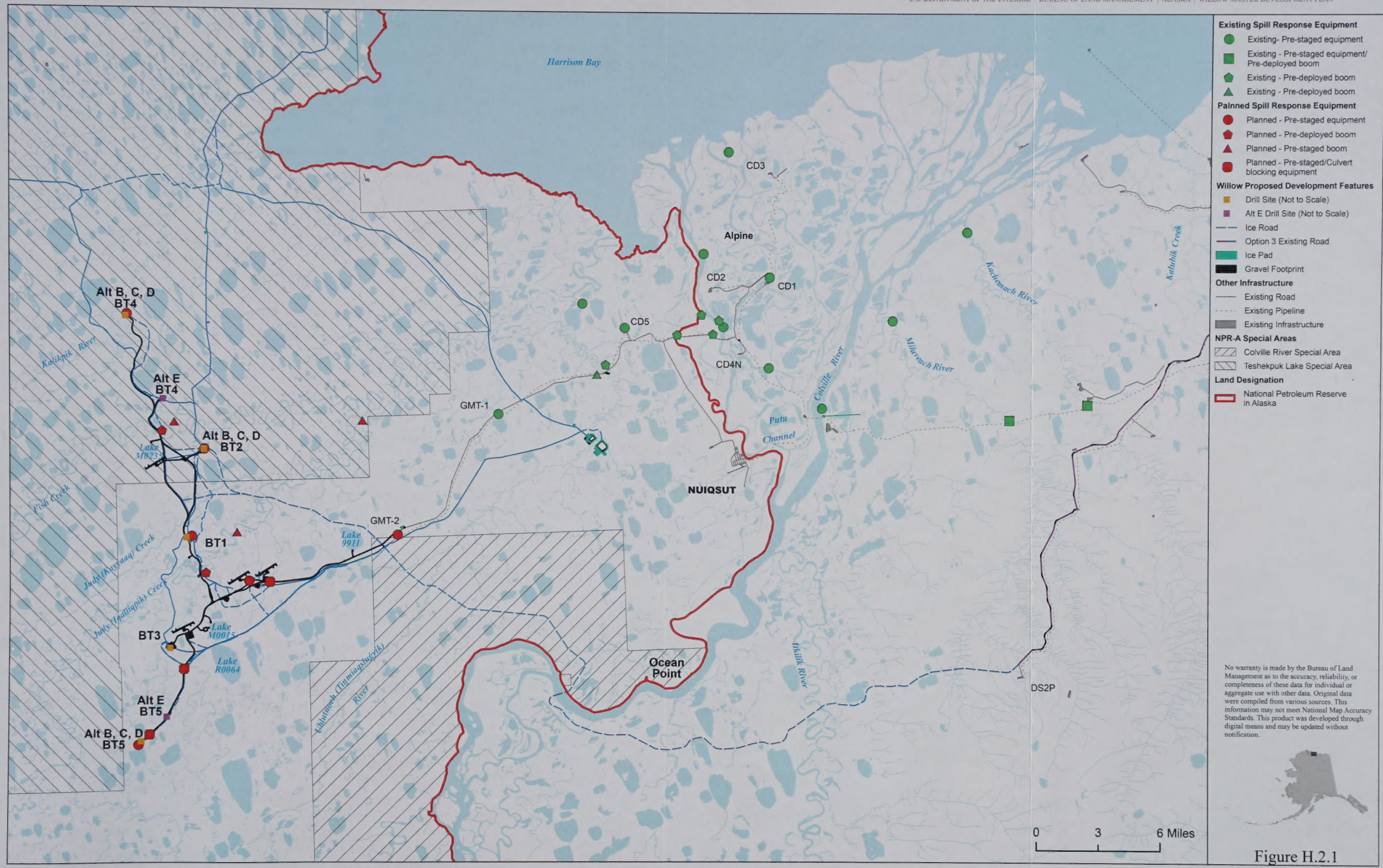

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure H.2.1

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2.3 Spill Response Training and Inspections

CPAI provides regular training for its employees and contractors on the importance of preventing oil or other hazardous material spills, including new employee orientation, annual environmental training seminars, and appropriate certification classes for specific issues covering spill prevention. CPAI's employees and contractors participate in frequent safety meetings that address spill prevention issues, as appropriate. The CPAI Incident Management Team participates in regularly scheduled training programs and conducts spill response drills in coordination with federal, state, and local agencies. Employees are encouraged to participate in the North Slope Spill Response Team where members receive regularly scheduled spill response training to ensure the continuous availability of skilled spill responders on the North Slope.

CPAI is required to conduct visual examinations of pipelines and facility piping with a frequency defined under 49 CFR 195.412 and 18 AAC 75.055 during operations at a minimum interval not exceeding 3 weeks. CPAI would provide aerial overflights as necessary to allow inspection both visually and with the aid of infrared technology, when required. Infrared technology allows for spill identification based on the temperature "signature" resulting when warm fluids leak. Infrared technology can detect warm spots in low-light conditions or when other circumstances such as light fog or drifted snow limit visibility. Infrared technology can also identify trouble spots along pipelines, such as damaged insulation, before a problem develops. CPAI would also conduct regular visual inspections of facilities and pipelines from gravel roads, where available, and from ice roads and aircraft for sections of pipelines not paralleled by gravel roads (Alternatives C and D).

2.3.1 Existing Area-Wide Oil Spill Response Training and Reconnaissance

In March 2020, BLM issued a Draft Update on North Slope Permitting and Activities (BLM 2020) for the NPR-A, including the Willow area. BLM intends to renew a right-of-way authorizing Alaska Clean Seas to conduct oil spill response training, deploy the equipment cache, and perform reconnaissance to determine the feasibility of pre-deploying a containment boom.

Summer reconnaissance activities will occur to determine the potential location of pre-staged equipment and pre-deployed containment boom sites and to obtain area knowledge to increase oil spill response preparedness. Training will consist of transporting Spill Response Team members to the sites and deploying boom and small skimming systems to determine the best methods of responding to an oil spill. This training would continue to identify ideal sites for collection and recovery of oil spilled from proposed pipelines and operating areas. These activities will occur regardless of the Project; however, it will affect preparedness and response for the Project should a spill occur and thus is considered when disclosing the Project's response training.

2.4 Fuel and Chemical Storage

Fuel and other chemicals would be stored primarily at the Willow central processing facility, with additional storage at the Willow Operations Center and drill sites. Diesel fuel would be stored in temporary tanks on-site during construction under all alternatives. During drilling and operations, the Willow Operations Center would include a diesel fuel supply storage tank(s), an associated fueling station, and a tank farm to store methanol, crude flowback, corrosion inhibitor, scale inhibitor, emulsion breaker, and various other chemicals as required.

Drill sites would have temporary tanks to support drilling activity, including brine tanks, a cuttings and mud tank, and a drill rig diesel fuel tank built into the drill rig structure. Production and operations storage tanks at drill sites would include chemical storage tanks that may contain any of the following depending on Project needs: corrosion inhibitor, methanol, scale inhibitor, emulsion breaker, antifoam, or ultra-low sulfur diesel. Portable oil storage tanks to support well and pad operational activities and maintenance (i.e., well work and well testing) may be present on an as-needed basis.

Fuel and oil storage would comply with local, state, and federal oil pollution prevention requirements, according to an ODPCP and a SPCC Plan. Secondary containment for fuel and oil storage tanks would be sized as appropriate to container type and according to the requirements in 18 AAC 75 and 40 CFR 112. Fuel and chemical storage associated with the Project would be managed under BLM LS and ROPs (Section 2.5 of this appendix, *Applicable Lease Stipulations and Best Management Practices*).

2.5 Applicable Lease Stipulations and Best Management Practices*

Table H.2.1 summarizes existing applicable NPR-A Integrated Activity Plan (IAP) LS and ROPs that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to the environment from

spills and accidental releases. CPAI would comply with applicable existing NPR-A IAP LS and ROPs related to fuels and hazardous materials handling and storage, spill prevention, and spill response, as outlined in BLM (2022). The LS and ROPs would reduce impacts to the environment from accidental spills or releases associated with the construction, drilling, and operations of oil and gas facilities. In 2021, BLM was directed to reevaluate the 2020 NPR-A IAP. The NPR-A IAP reevaluation resulted in the issuance of a new NPR-A IAP Record of Decision (ROD) that selected an alternative similar to the 2013 NPR-A IAP ROD. Full text of the requirements is provided in BLM (2022).

Table H.2.1. Summary of Applicable Lease Stipulations and Required Operating Procedures Intended to Mitigate Impacts from Potential Spills*

LS or ROP	Description or Objective	Requirement/Standard
ROP A-3	Minimize pollution through effective hazardous-materials contingency planning.	A hazardous materials emergency contingency plan shall be prepared before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. The plan shall include a list of resources available for response. In addition, contingency plans shall include requirements to: a. Provide refresher spill-response training to NSB and local community spill-response teams on a yearly basis b. Plan and conduct a major spill-response drill annually c. Develop spill prevention and response contingency plans and participate in the North Slope Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases for the NPR-A operating area.
ROP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Before initiating any oil and gas or related activity or operation, develop a comprehensive spill prevention, control, and countermeasure plan per 40 CFR 112. The plan shall consider the following requirements: a. Sufficient oil-spill-cleanup materials shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by crews on all overland moves. b. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Fuel, petroleum products, and other liquid chemicals that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers. Within 500 feet of waterbodies, fuel containers are to be stored within appropriate containment. c. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period. d. Permanent fueling stations shall be lined or have impermeable protection. e. All fuel containers shall be marked with the responsible party's name, product type, and year filled or purchased. f. Notice of any reportable spill (as required by 40 CFR 300.125 and 18 AAC 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence. g. All oil pans (i.e., "duck ponds") shall be marked with the responsible party's name.
ROP A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody with the exception that small caches (up to 210 gallons) for motorboats, float planes, ski planes, and small equipment.
ROP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.
ROP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an AO-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.

Source: BLM 2022

Note: AO (authorized officer); LS (lease stipulation); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure).

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Willow Master Development Plan

Appendix I
Avoidance, Minimization, and Mitigation Technical Appendix

January 2023

Appendix I.1
Avoidance, Minimization, and Mitigation

Appendix I.2
ConocoPhillips Road Optimization Memorandum

Appendix I.3
Dust Control Plan

Appendix I.4
Permittee-Responsible Wetlands Compensatory Mitigation Plan

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Willow Master Development Plan

Appendix I.1
Avoidance, Minimization, and Mitigation

January 2023

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List of Acronyms

µPa	micropascal
°F	degrees Fahrenheit
ADEC	Alaska Department of Environmental Conservation)
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
agl	above ground level
AOGCC	Alaska Oil and Gas Conservation Commission)
BLM	Bureau of Land Management
BT1	Bear Tooth 1 drill site
BT2	Bear Tooth 2 drill site
BT3	Bear Tooth 3 drill site
BT4	Bear Tooth 4 drill site
BT5	Bear Tooth 5 drill site
CPAI	ConocoPhillips Alaska, Inc.
dB	decibel
DEW	Distant Early Warning
DMLW	Division of Mining, Land, Water
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GIS	geographic information system
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
ITR	Incidental Take Regulation
LS	lease stipulation

MDP	Master Development Plan
MMPA	Marine Mammal Protection Act
mph	miles per hour
MTI	module transfer island
NMFS	National Marine Fisheries Service
No.	number
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHW	ordinary high water
PM	particulate matter
Project	Willow Master Development Plan Project
RMS	Regional Mitigation Strategy
ROD	Record of Decision
ROP	required operating procedure
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSM	vertical support member
WSE	water surface elevation
WPF	Willow Processing Facility

1.0 APPLICABLE LEASE STIPULATIONS AND REQUIRED OPERATING PROCEDURES*

The 2022 National Petroleum Reserve in Alaska (NPR-A) Integrated Activity Plan (IAP)/Environmental Impact Statement (EIS) Record of Decision (ROD) established performance-based lease stipulations (LSs) and required operating procedures (ROPs) that apply to oil and gas activities within the NPR-A (BLM 2022). Table I.1.1 summarizes NPR-A IAP LSs and ROPs that would apply to the Willow Master Development Plan Project (Project) and are intended to mitigate Project impacts. In 2021, the Bureau of Land Management (BLM) was directed to reevaluate the 2020 NPR-A IAP. The NPR-A IAP reevaluation resulted in the issuance of a new NPR-A IAP ROD (BLM 2022) that selected an alternative nearly identical to the 2013 NPR-A IAP ROD. Updated ROPs (BLM 2022) adopted in the new NPR-A IAP ROD replaced previous ROPs; however, applicable LSs have not changed because LSs are fixed at the time of the lease issuance. All projects are subject to the LSs and ROPs that are in place at the time the permit for development is issued. (The reader is referred to Section 2.2.7, *Lease Stipulations, Required Operating Procedures, and Lease Notices*, of the 2020 IAP/EIS for further discussion on this topic). The Willow MDP ROD will detail which of the measures described below will be implemented for the Project. Table I.1.1 summarizes the updated 2022 applicable NPR-A IAP LSs and ROPs; full text of the requirements is provided in BLM (2020).

The ROPs are organized to address the following topics:

A. Waste prevention, handling, disposal, spills, air quality, and public health and safety
B. Water use for permitted activities
C. Winter overland moves and seismic work
D. Oil and gas exploratory drilling
E. Facility design and construction
F. Use of aircraft for permitted activities
G. Oil field abandonment
H. Subsistence consultation for permitted activities
I. Orientation programs associated with permitted activities
J. Endangered Species Act Section 7 consultation process
K. Additional protections that apply in select biologically sensitive areas
L. Summer vehicle tundra access
M. General wildlife and habitat protection

Table I.1.1. Applicable Lease Stipulations and Required Operating Procedures*

LS or ROP	Description of Objective	Requirement/Standard
ROP A-1	Protect the health and safety of oil and gas field workers and the general public by disposing of solid waste and garbage in accordance with applicable federal, State, and local law and regulations.	Areas of operation shall be left clean of all debris.
ROP A-2	Minimize impacts on the environment from non-hazardous and hazardous waste generation. Encourage continuous environmental improvement. Protect the health and safety of oil field workers and the general public. Avoid human-caused changes in predator populations.	Lessees/permittees shall prepare and implement a comprehensive waste management plan for all phases of exploration and development, including seismic activities. The plan shall be submitted to the AO for approval, as part of a plan of operations or other similar permit application. Waste generation shall be addressed in the following order of priority: 1) prevention and reduction, 2) recycling, 3) treatment, and 4) disposal. The plan shall consider the following requirements: a. The plan shall identify precautions that are to be taken to avoid attracting wildlife to food and garbage. b. Requirements prohibit the burial of garbage. Users shall have a written procedure to ensure that the handling and disposal of putrescible waste will be accomplished in a manner that prevents the attraction of wildlife. All putrescible waste shall be incinerated, backhauled, or composted in a manner approved by the AO. All solid waste, including incinerator ash, shall be disposed of in an approved waste-disposal facility. The burial of human waste is prohibited. c. BLM requires all pumpable solid, liquid, and sludge waste be disposed of by injection in accordance with EPA, DEC, and AOGCC regulations and procedures. d. BLM prohibits wastewater discharges or disposal of domestic wastewater into bodies of water, including wetlands, unless authorized by a National Pollutant Discharge Elimination System or State permit.
ROP A-3	Minimize pollution through effective hazardous-materials contingency planning.	A hazardous materials emergency contingency plan shall be prepared before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. The plan shall include a list of resources available for response. In addition, contingency plans shall include requirements to: a. Provide refresher spill-response training to NSB and local community spill-response teams on a yearly basis b. Plan and conduct a major spill-response drill annually c. Develop spill prevention and response contingency plans and participate in the North Slope Subarea Contingency Plan [superseded by the Alaska Inland Area Contingency Plan] for Oil and Hazardous Substances Discharges/Releases for the NPR-A operating area.

LS or ROP	Description of Objective	Requirement/Standard
ROP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Before initiating any oil and gas or related activity or operation, develop a comprehensive spill prevention, control, and countermeasure plan per 40 CFR 112. The plan shall consider the following requirements: a. Sufficient oil-spill-cleanup materials shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by crews on all overland moves. b. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Fuel, petroleum products, and other liquid chemicals that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers. Within 500 feet of waterbodies, fuel containers are to be stored within appropriate containment. c. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period. d. Permanent fueling stations shall be lined or have impermeable protection. e. All fuel containers shall be marked with the responsible party's name, product type, and year filled or purchased. f. Notice of any reportable spill (as required by 40 CFR 300.125 and 18 AAC 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence. g. All oil pans (i.e., "duck ponds") shall be marked with the responsible party's name.
ROP A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody with the exception that small caches (up to 210 gallons) for motorboats, float planes, ski planes, and small equipment.
ROP A-6	Minimize the impact on fish, wildlife, and the environment from contaminants associated with the exploratory drilling process.	Surface discharge of reserve-pit fluids is prohibited.
ROP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.
ROP A-8	Minimize conflicts resulting from interaction between humans and bears during oil and gas activities.	Lessees will prepare and implement bear-interaction plans to minimize conflicts between bears and humans. These plans shall include measures to: a. Minimize attraction of bears to the drill sites. b. Organize layout of buildings and work sites to minimize human-bear interactions. c. Warn personnel of bears near or on work sites and identify proper procedures to be followed. d. Establish procedures, if authorized, to discourage bears from approaching the work site. e. Provide contingencies in the event bears do not leave the site or cannot be discouraged by authorized personnel. f. Discuss proper storage and disposal of materials that may be toxic to bears. g. Provide a systematic record of bears on the work site and in the immediate area.
ROP A-9	Reduce air quality impacts.	All operations (vehicles and equipment) that burn diesel fuels must use "ultra-low sulfur" diesel as defined by EPA.

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ROP A-10	Prevent unnecessary or undue degradation of the lands and protect health.	This measure includes the following elements: a. BLM may require a project proponent to provide a minimum of one year of baseline ambient air monitoring data for any pollutants of concern. If BLM determines baseline monitoring is required, this pre-analysis data must meet DEC and EPA air monitoring standards and cover the year prior to the submittal. b. BLM may require monitoring for the life of the project, depending on the potential air emissions' magnitude, proximity to a federal Class I area, Class II area, or population center, proximity to a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, existing area development, or issues identified during the project's NEPA analysis. c. For an application to develop a potential substantial air pollutant emission source, the proponent shall prepare an emissions inventory that includes quantified emissions of regulated air pollutants from all direct and indirect sources related to the proposed project. d. For an application to develop a potential substantial air pollutant emission source, BLM may require the proponent to provide an emissions reduction plan. e. For an application to develop a potential substantial air pollutant emission source, the AO may require air quality modeling analyzing the project's direct, indirect or cumulative impacts to air quality. The modeling shall compare predicted impacts to all applicable local, State, and federal air quality standards and increments, as well as other scientifically defensible significance thresholds. f. BLM may require air quality mitigation measures and strategies within its authority, in addition to regulatory requirements and proponent committed emission reduction measures. g. If ambient air monitoring indicates project-related emissions are causing or contributing to impacts that would cause undue degradation, exceedances of NAAQS, or fail to protect health, the AO may require changes to reduce emissions. h. Publicly available reports on air quality baseline monitoring, emissions inventory, and modeling results shall be provided by the project proponent to the NSB and to local communities and Tribes.
ROP A-11	Ensure that permitted activities do not create human health risks through the contamination of subsistence foods.	A lessee proposing a permanent development shall design and implement a monitoring study of contaminants in locally-used subsistence foods. The study shall examine subsistence foods for all contaminants that could be associated with the proposal. The study shall identify the level of contaminants in subsistence foods prior to the proposed development and monitor the level of these contaminants throughout the development's operation and abandonment phases. If ongoing monitoring detects a measurable and persistent increase in a contaminant in subsistence foods, the lessee shall design and implement a study to determine how much, if any, of the increase in the contaminant in subsistence foods originates from the lessee's activities. If the study determines that a portion of the increase in contamination in subsistence foods is caused by the lessee's activities, the AO may require changes in the lessee's processes to reduce or eliminate the contaminant's emissions.
ROP A-12	To minimize negative health impacts associated with oil spills.	If an oil spill with potential impacts to public health occurs, BLM will consider: a. Immediate health impacts and responses for affected communities and individuals. b. Long-term contamination monitoring of subsistence food sources. c. Long-term monitoring of potential human health impacts. d. Perceptions of contamination and subsequent changes in consumption patterns. e. Health promotion activities and communication strategies to maintain traditional food consumption.
ROP B-1	Maintain populations of, and adequate habitat for, fish and invertebrates.	Withdrawal of unfrozen water from rivers and streams during winter is prohibited. The removal of ice aggregate from grounded areas ≤4-feet deep may be authorized from rivers on a site-specific basis.

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ROP B-2	Maintain natural hydrologic regimes in soils surrounding lakes and ponds, and maintain populations of, and adequate habitat for, fish, invertebrates, and waterfowl.	Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas ≤4-feet deep may be authorized on a site-specific basis. Current water use requirements are: a. Lakes with sensitive fish (i.e., any fish except ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 15% of calculated volume deeper than 7 feet; only ice aggregate may be removed from lakes that are ≤7-feet deep. b. Lakes with only non-sensitive fish (i.e., ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 30% of calculated volume deeper than 5 feet; only ice aggregate may be removed from lakes that are ≤5-feet deep. c. Lakes with no fish present, regardless of depth: water available for use is limited to 35% of total lake volume. d. In lakes where unfrozen water and ice aggregate are both removed, the total use shall not exceed the respective 15%, 30%, or 35% volume calculations. e. Additional modeling or monitoring may be required to assess water level and water quality conditions before, during, and after water use from any fish-bearing lake or lake of special concern. f. Any water intake structures shall be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. Note: All water withdrawal equipment must be equipped and must use fish screening devices approved by the ADF&G. g. Compaction of snow cover or snow removal from fish-bearing waterbodies shall be prohibited except at approved ice road crossings, water pumping stations on lakes, or areas of grounded ice.
ROP C-1	Protect grizzly bear, polar bear, and marine mammal denning and/or birthing locations.	a. Grizzly bear dens: Cross-country use of vehicles, equipment, and oil and gas activity is prohibited within 0.5 mile of occupied grizzly bear dens, unless protective measures are approved by BLM. b. Polar bear dens: Cross-country use of vehicles, equipment, and oil and gas activity is prohibited within 1 mile of known or observed polar bear dens, unless alternative protective measures are approved by BLM. c. To limit disturbance around known polar bear dens, implement the following: 1. Onshore activities in known or suspected polar bear denning habitat during the denning season (approximately November to April) must make efforts to locate occupied polar bear dens. All observed or suspected polar bear dens must be reported to USFWS prior to the initiation of activities. 2. Permittees must observe a 1-mile operational exclusion zone around all known polar bear dens during the denning season (or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered, work must cease and USFWS must be contacted for guidance. Potential actions may range from cessation or modification of work to conducting additional monitoring. 3. Use the den habitat map developed by USGS. 4. Restrict activity timing to limit disturbance around dens. d. To limit disturbance of activities to seal lairs in the nearshore area (< 9.8-foot water depth): 1. Prior to the initiation of winter seismic surveys on marine ice, the permittee will conduct a sound source verification test approved by BLM and NMFS. 2. For all activities: i. Maintain airborne sound levels of equipment below 100 db re 20 µPa at 66 feet. ii. On-ice operations after May 1 will employ a full-time protected species observer on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 feet and will ensure that all equipment with airborne noise levels are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 decibels. iii. Sea ice trails must not be greater than 12-feet wide. iv. No unnecessary equipment or operations will be placed or used on sea ice.

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ROP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	a. Ground operations shall be allowed only when frost and snow cover are sufficient to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 15); the exact dates will be determined by the AO. b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year. f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River.
ROP C-3	Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.	Crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice ("bridges") shall be removed, breached, or slotted before spring breakup. Ramps and bridges shall be substantially free of soil and debris.
ROP C-4	Avoid additional freeze-down of deep-water pools harboring over-wintering fish and invertebrates used by fish.	Travel up and down streambeds is prohibited unless it can be demonstrated that there will be no additional impacts to over-wintering fish or invertebrates. Rivers, streams, and lakes shall be crossed at areas of grounded ice whenever possible.
ROP C-5	Minimize the effects of high-intensity acoustic energy from seismic surveys on fish.	a. When conducting vibroseis-based surveys above potential fish overwintering areas (water 6 feet deep or greater, ice plus liquid depth), operators shall follow recommendations by Morris and Winters (2005): only a single set of vibroseis shots should be conducted if possible; if multiple shot locations are required, these should be conducted with minimal delay; multiple days of vibroseis activity above the same overwintering area should be avoided if possible. b. When conducting air gun-based surveys in freshwater, operators shall follow standard marine mitigation measures that are applicable to fish (e.g., Minerals Management Service 2006): operators will use the lowest sound levels feasible to accomplish their data-collection needs; ramp-up techniques will be used. c. When conducting explosive-based surveys, operators shall follow setback distances from fish-bearing waterbodies based on requirements outlined by ADF&G (1991).
ROP D-1	Minimize surface impacts from exploratory drilling.	Construction of permanent or gravel oil and gas facilities shall be prohibited for exploratory drilling. Use of a previously constructed road or pad may be permitted if it is environmentally preferred.
ROP E-1	Protect subsistence use and access to subsistence hunting and fishing areas and minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources.	All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence use areas.
ROP E-2	Protect fish-bearing waterbodies, water quality, and aquatic habitats.	Permanent oil and gas facilities are prohibited within 500 feet of fish-bearing waterbodies (as measured from the ordinary high water mark). Essential pipeline and road crossings will be permitted on a case-by-case basis. Note: Also refer to Stipulations K-1 and K-2.
ROP E-3	Maintain free passage of marine and anadromous fish and protect subsistence use and access to subsistence hunting and fishing.	Linear infrastructure that connects to the shoreline (e.g., causeways, docks) is prohibited in river mouths or deltas. Artificial gravel islands and permanent bottom-founded structures are prohibited in river mouths or active stream channels on river deltas.

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ROP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an AO-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.
ROP E-5	Minimize impacts of the development footprint.	Facilities shall be designed and located to minimize the development footprint. Issues and methods to be considered include: a. Use of maximum extended-reach drilling for production drilling. b. Sharing facilities with existing development. c. Collocation of all oil and gas facilities, except airstrips, docks, and seawater-treatment plants, with drill pads. d. Integration of airstrips with roads. e. Use of gravel-reduction technologies (e.g., insulated or pile-supported pads). f. Coordination of facilities with infrastructure in support of offshore development. Note: Where aircraft traffic is a concern, consideration shall be given to balancing gravel pad size and available supply storage capacity with potential reductions in the use of aircraft to support oil and gas operations.
ROP E-6	Reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, alteration of natural drainage patterns, and restriction of fish passage.	Stream and marsh crossings shall be designed and constructed to ensure free passage of fish, reduce erosion, maintain natural drainage, and minimize adverse effects to natural stream flow. Note: Bridges, rather than culverts, are the preferred method for crossing rivers. When necessary, culverts can be constructed on smaller streams, if they are large enough to avoid restricting fish passage or adversely affecting natural stream flow.
ROP E-7	Minimize disruption of caribou movement and subsistence use.	Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. The accepted design practices are: a. Elevating aboveground pipelines a minimum of 7 feet as measured from the ground to the bottom of the pipeline at VSMs. b. In areas where facilities or terrain may funnel caribou movement, ramps over pipelines, buried pipelines, or pipelines buried under roads may be required by the AO. c. A minimum distance of 500 feet between pipelines and roads shall be maintained. Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, alternative pipeline routes, designs and possible burial within the road will be considered by the AO.
ROP E-8	Minimize the impact of mineral materials mining activities on air, land, water, fish, and wildlife resources.	Gravel mine site design and reclamation will be in accordance with a plan approved by the AO. The plan shall consider: a. Locations outside the active flood plain. b. Design of gravel mine sites within active flood plains to serve as water reservoirs for future use. c. Potential use of the site for enhancing fish and wildlife habitat. d. Potential storage and reuse of sod/overburden for the mine site or at other disturbed sites on the North Slope.
ROP E-9	Avoidance of human-caused increases in populations of predators of ground nesting birds.	a. Lessee shall use best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. The lessee shall provide the AO with an annual report on the use of facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites. b. Feeding wildlife is prohibited.
ROP E-10	Minimize bird collisions with infrastructure, especially during migration and inclement weather.	Flagging of structures (e.g., elevated utility lines, guy wires) shall be required to minimize bird collision. All facility external lighting shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in clouds and fog conditions.

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ROP E-11	Minimize impacts on bird species, particularly those listed under the Endangered Species Act and BLM special status species, resulting from direct or indirect interaction with infrastructure.	Bird species with special status are protected under ROP E-10 and ROP E-21, and by the protections outlined below. Before the approval of infrastructure construction, the following studies shall be conducted and recommended design elements shall be incorporated. *Special Conditions in Spectacled and/or Steller's Eiders Habitats:* a. BLM requires submittal of a minimum of 3 years of site-relevant survey data before authorization of construction, if such construction is within spectacled and Steller's eider habitats. BLM will evaluate adequacy of survey data and ecological mapping to determine if ground-based nest surveys are required. Information gained from these surveys shall be used to make infrastructure siting decisions. b. If spectacled and/or Steller's eiders are determined to be present within the proposed development area, the applicant shall work with USFWS and BLM early in the design process to site roads and facilities in order to minimize impacts to nesting and brood-rearing eiders and their habitats. *Special Conditions in Yellow-billed Loon Habitats:* The permittee shall determine and submit to BLM information on yellow-billed loon habitat presence within a project area using the most current data and analysis results from research conducted within the NPR-A. a. If yellow-billed loon habitat is determined to be present within the project area, BLM will require submittal of a minimum of 3 years of site-relevant survey data of lakes greater than 25 acres within 1 mile of the proposed infrastructure. b. The design and location of infrastructure must minimize disturbance. The default standard mitigation shall be a minimum 0.5-mile buffer around all recorded nest sites and shall be up to 1 mile, where feasible. Lakes with yellow-billed loon occupancy shall also include a minimum 1,625-foot buffer around the shoreline. Development would generally be prohibited within buffers; BLM would consider waivers or modifications to this requirement if no other feasible option exists.
ROP E-12	Use ecological mapping as a tool to assess wildlife habitat before development of permanent facilities to conserve important habitat types during development.	An ecological land classification map of the development area shall be developed before approval of facility construction. The map will integrate geomorphology, surface form, and vegetation at a scale, level of resolution, and level of positional accuracy adequate for detailed analysis of development alternatives.
ROP E-13	Protect cultural and paleontological resources.	Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee shall notify the AO and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the AO.
ROP E-14	Ensure the passage of fish at stream crossings.	To ensure that crossings provide for fish passage, all proposed crossing designs shall adhere to the ROPs outlined in "Stream Crossing Design Procedure for Fish Streams on the North Slope Coastal Plain" by McDonald et al. (1994), "Fundamentals of Culvert Design for Passage of Weak-Swimming Fish" by Behlke et al. (1991), and other generally accepted best management procedures prescribed by the AO.
ROP E-15	Prevent or minimize the loss of nesting habitat for cliff nesting raptors.	a. Removal of more than 100 cubic yards of bedrock outcrops, sand, and/or gravel from cliffs shall be prohibited. b. Any extraction of sand and/or gravel from an active river or stream channel shall be prohibited unless preceded by a hydrological study that indicates no potential impact to the integrity of the river bluffs.

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ROP E-17	Manage permitted activities to meet Visual Resource Management class objectives described below.	Class I: Natural ecological changes and very limited management activity are allowed. The level of change to the characteristic landscape should be very low and must not attract attention. Class II: The level of change to the characteristic landscape should be low. Management activities may be seen but should not dominate the view of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Class III: The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Class IV: The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize impacts through location and design by repeating form, line, color, and texture. Requirement/Standard: At the time of application for construction of permanent facilities, the lessee/permittee shall submit a plan to minimize visual impacts consistent with the Visual Resource Management class for the lands on which facilities would be located. VRM classes: • Class II: Wainwright Inlet and those areas where new infrastructure is not allowed. • Class III: Except for those areas designated as VRM Class II, rivers and lands within 3 miles of segments of rivers identified as eligible for Wild and Scenic River designation in the 2013 IAP or the 2008 Northeast NPR-A Supplemental IAP. • Class IV: The rest of the area.
ROP E-18	Avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests.	Ground-level activity (by vehicle or on foot) within 656 feet (200 meters) of occupied Steller's and/or spectacled eider nests from June 1 through August 15, will be restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 656 feet of occupied Steller's and/or spectacled eider nests will be prohibited. In cases in which oil spill response training is proposed to be conducted within 656 feet of shore in riverine, marine, or inter-tidal areas, BLM will work with USFWS to schedule the training at a time that is not a sensitive nesting/brood-rearing period or require that nest surveys be conducted in the training area prior to a decision on approving the training.
ROP E-19	Provide information to be used in monitoring and assessing wildlife movements during and after construction.	GIS-compatible shape-files of all new infrastructure construction shall be provided to the AO. Infrastructure includes all gravel roads and pads, facilities built on pads, pipelines and independently constructed powerlines.

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ROP E-20	Minimize the impacts on bird species from direct interaction with aboveground utility infrastructure.	a. To reduce the possibility of birds colliding with aboveground utility lines, such lines would either be buried in access roads or suspended on VSMs. Exceptions are limited to the following situations: 1. Overhead utility lines may be allowed when located entirely within the boundaries of a facility pad. 2. Overhead utility lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a VSM. 3. Overhead utility lines may be allowed in situations when human safety would be compromised by other methods. b. To reduce the likelihood of birds colliding with them, communication towers would be located on existing pads and as close as possible to buildings or other structures and on the east or west side of buildings or other structures, if possible. Support wires would be avoided to the extent practicable. If support wires are necessary, they would be clearly marked along their entire length to improve visibility to low-flying birds. c. Design of other utility infrastructure, such as wind turbines, would be evaluated under a specific development proposal. d. The permittee shall comply with current industry-accepted practices for raptor protection on power lines, such as the most recent Avian Power Line Interaction Committee suggested practices.
ROP F-1	Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.	The lessee shall ensure that aircraft used for permitted activities maintain altitudes according to the following guidelines (Note: This ROP is not intended to restrict flights necessary to survey wildlife. Flights necessary to gain this information will be restricted to the minimum.): a. Aircraft shall maintain an altitude of at least 1,500 feet aboveground level when within 0.5 mile of cliffs identified as raptor nesting sites from April 15 through August 15. b. Aircraft shall maintain an altitude of at least 1,000 feet above ground level over caribou winter ranges from December 1 through May 1. c. Land user shall submit an aircraft use plan as part of an oil and gas development proposal. The plan shall address strategies to minimize impacts to subsistence hunting and associated activities. d. Proposed aircraft use plans should be reviewed by appropriate federal, State, and borough agencies. Adjustments, including suspension of all flights, may be required by the AO if resulting disturbance is determined to be unacceptable. e. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies should be limited to the maximum extent possible. f. Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou and moose hunting) should be kept to a minimum. g. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level over the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20. Aircraft use by oil and gas lessees in the Goose Molting Area should be minimized from May 20 through August 20. h. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level over the Utukok River Uplands Special Area from May 20 through August 20. i. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. j. Fixed-wing aircraft used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 2,000 feet when within a 0.5 mile of walrus haulouts. Helicopters used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 3,000 feet and a 1.0-mile buffer from walrus haulouts. k. Aircraft used as part of a BLM-authorized activity along the coast and shore fast ice zone shall maintain minimum altitude of 3,000 feet when within 1.0 mile of all listed marine mammal species.

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LS G-1	Ensure long-term reclamation of land to its previous condition and use.	Prior to final abandonment, land used for oil and gas infrastructure shall be reclaimed to ensure eventual restoration of ecosystem function. The leaseholder shall develop and implement an abandonment and reclamation plan approved by BLM. The plan shall describe short-term stability, visual, hydrological, and productivity objectives and steps to be taken to ensure eventual ecosystem restoration to the land's previous hydrological, vegetative, and habitat condition.
ROP H-1	Provide opportunities for participation in planning and decision making to prevent unreasonable conflicts between subsistence uses and other activities.	Lessee/permittee shall consult directly with affected communities using the following guidelines: a. Before submitting an application to BLM, the applicant shall consult with directly affected subsistence communities, NSB, and the NPR-A Subsistence Advisory Panel to discuss the siting, timing, and methods of their proposed operations. The applicant shall make every reasonable effort, including such mechanisms as conflict avoidance agreements and mitigating measures, to ensure that proposed activities will not result in unreasonable interference with subsistence activities. b. The applicant shall submit documentation of consultation efforts as part of its operations plan. The applicant must allow time for BLM to conduct formal government-to-government consultation with Native Tribal governments if the proposed action requires it. c. A plan shall be developed that shows how the activity will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The plan should address the following items: 1. A detailed description of the activities to take place. 2. A description of how the lessee/permittee will minimize and/or address potential impacts identified by the AO. 3. A detailed description of the monitoring effort to take place, including process, procedures, personnel involved and points of contact both at the work site and in the local community. 4. Communication elements to provide information on how the applicant will keep potentially affected individuals and communities up-to-date on the progress of the activities and locations of possible, short-term conflicts with subsistence activities. 5. Procedures necessary to facilitate access by subsistence users to the permittees' area of activity or facilities. d. During development, monitoring plans must be established for new permanent facilities to assess an appropriate range of potential effects on resources and subsistence. e. Permittees that propose barging facilities, equipment, supplies, or other materials to the NPR-A in support of activities in the NPR-A shall notify, confer, and coordinate with the Alaska Eskimo Whaling Commission, the appropriate local community whaling captains' associations, and NSB to minimize impacts from barging on subsistence whaling activities. f. Barge operators requiring a BLM permit are required to demonstrate that barging activities will not have unmitigable adverse impacts on the availability of marine mammals to subsistence hunters. g. All vessels over 50-feet long engaged in operations requiring a BLM permit must have an Automatic Identification System transponder system on the vessel.

LS or ROP	Description of Objective	Requirement/Standard
ROP H-2	Prevent unreasonable conflicts between subsistence activities and geophysical (seismic) exploration.	Before activity to conduct seismic exploration begins, applicants shall notify the local search and rescue organizations of proposed survey locations. A potentially affected cabin/campsite is defined as any camp or campsite used for subsistence purposes and located within the boundary of the exploration area and/or within 1 mile of operation travel routes. a. The permittee will notify all potentially affected subsistence-use cabin and campsite users. b. The official recognized list of subsistence-use cabin and campsite users is the NSB's most current inventory. c. A copy of the notification, a map of the proposed exploration area, and the list of potentially affected users shall also be provided to the office of the appropriate Native Tribal government. d. The AO will prohibit seismic work within 1 mile of any known subsistence-use cabin or campsite unless an alternate agreement between the cabin/campsite owner/user is reached through the consultation process and presented to the AO. e. The permittee shall notify the appropriate local search and rescue organization of their current operational location within the NPR-A on a weekly basis.
ROP H-3	Minimize impacts to sport hunting and trapping species and to subsistence harvest of those animals.	Hunting and trapping by lessee's/permittee's employees, agents, and contractors are prohibited when persons are on "work status." Work status is defined as the period during which an individual is under the control and supervision of an employer. Work status is terminated when the individual's shift ends and he/she returns to a public airport or community (e.g., Fairbanks, Barrow, Nuiqsut, or Deadhorse). Use of lessee/permittee facilities, equipment, or transport for personal access or aid in hunting and trapping is prohibited.
ROP I-1	Minimize cultural and resource conflicts.	All personnel shall be provided information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. All personnel involved in permitted activities shall attend an orientation program at least once a year and the orientation program should: a. Provide sufficient detail to notify personnel of applicable stipulations and ROPs, as well as specific types of environmental, social, and traditional and cultural concerns that relate to the region. b. Address the importance of not disturbing archaeological and biological resources and habitats, and provide guidance on how to avoid disturbance. c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species. d. Be designed to increase sensitivity and understanding of local community values, customs, and lifestyles. e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation. f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site. h. Include on-site records of all personnel who attend the program for so long as the site is active. i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans. j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel. k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities.

LS or ROP	Description of Objective	Requirement/Standard
ROP J	Endangered Species Act – Section 7 consultation process	The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or to have some other special status. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that will contribute to the need to list such a species or their habitat. BLM may require modifications to or disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. BLM will not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended (16 USC 531 et seq.), including completion of any required procedure for conference or consultation.
LS K-1	*River Setbacks* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values. *Colville River Special Area Management Plan—Protection 1* Minimize the loss of arctic peregrine falcon nesting habitat in the Colville River Special Area.	*River Setbacks* Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by case basis, essential pipeline and road crossings will be permitted through setback areas. a. Colville River: A 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to the juncture of Thunder and Storm creeks, the setback is 0.5 mile. b. Fish Creek: A 3-mile setback from the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a 0.5-mile setback farther upstream. c. Judy (Kayyaaq) Creek: A 0.5-mile setback. d. Ublutuoch (Tiŋmiaqsiuġvik) River: a 0.5-mile setback. *Colville River Special Area Management Plan—Protection 1* To minimize the direct loss of arctic peregrine falcon nesting habitat and to protect nest sites in the Colville River Special Area, the following protective measures apply: Permanent oil and gas facilities, including gravel pads, roads, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below. On a case-by-case basis, essential pipeline and road crossings will be permitted through setback areas.
LS K-2	*Deepwater Lakes* Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deepwater lakes; the loss of spawning, rearing or over wintering habitat for fish; the loss of cultural and paleontological resources; impacts to subsistence cabin and campsites; and the disruption of subsistence activities.	Generally, permanent oil and gas facilities are prohibited on the lake or lakebed and within 0.25 mile of the ordinary high water mark of any deep lake as determined to be in lake zone III (i.e., depth greater than 13 feet [4 meters]; Mellor 1985). On a case-by-case basis, essential pipeline(s), road crossings, and other permanent facilities may be considered through the permitting process in these areas where the lessee can demonstrate on a site-specific basis that impacts will be minimal.

LS or ROP	Description of Objective	Requirement/Standard
LS K-3	*Waterbodies and Riparian Areas* Protect fish-bearing rivers, streams, and lakes from blowouts and minimize alteration of riparian habitat.	Exploratory drilling is prohibited in rivers and streams, as determined by the active floodplain, and fish-bearing lakes.
LS K-4	*Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon* Protect fish and wildlife habitat (including, but not limited to, that for waterfowl and shorebirds, caribou insect-relief, and marine mammals), preserve air and water quality, and minimize impacts to subsistence activities and historic travel routes on the major coastal waterbodies.	The Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon, and their associated Islands are unavailable for leasing. With the exception of linear features such as pipelines, no permanent oil and gas facilities are permitted on or under the water within 0.75 mile seaward of the shoreline of the major coastal waterbodies or the natural coastal islands. Elsewhere, permanent facilities within the major coastal waterbodies will only be permitted on or under the water if they can meet all the following criteria: a. Design and construction of facilities shall minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources. b. Daily operational activities, including use of support vehicles, watercraft, and aircraft traffic, shall be conducted to minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources. c. The location of oil and gas facilities shall be sited and constructed so as to not pose a hazard to navigation by the public using traditional high-use subsistence-related travel routes into and through the major coastal waterbodies as identified by the NSB. d. Demonstrated year-round oil spill response capability, including the capability of adequate response during periods of broken ice or open water, or the availability of alternative methods to prevent well blowouts during periods when adequate response capability cannot be demonstrated e. Reasonable efforts will be made to avoid or minimize impacts related to oil spill response activities, including vessel, aircraft, and pedestrian traffic that add to impacts on area resources and subsistence uses. f. Before conducting open water activities, the permittee shall consult with the Alaska Eskimo Whaling Commission and the NSB to minimize impacts to the fall and spring subsistence whaling activities of North Slope communities.
LS K-5	*Coastal Area Setbacks* Protect coastal waters and their value as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals), minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears, and the summer shoreline habitat for walrus and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts to subsistence resources and activities.	a. Drill pads and central processing facilities would not be allowed in coastal waters or on islands between the northern boundary of the NPR-A and the mainland, or in inland areas within 1 mile of the coast. Other facilities necessary for oil and gas production within NPR-A that necessarily must be within this area (e.g., barge landing, seawater treatment plant, or spill response staging and storage areas) would not be precluded. Lessees/permittees shall consider the practicality of locating facilities that necessarily must be within this area at previously occupied sites such as various Husky/USGS drill sites and Distant Early Warning-Line sites. Before conducting open water activities, the lessee shall consult with the Alaska Eskimo Whaling Commission, NSB, and local whaling captains associations to minimize impacts to subsistence whaling activities. b. Marine vessels used as part of a BLM-authorized activity shall maintain a 1-mile buffer from the shore when transiting past an aggregation of seals, Steller's sea lions, or walruses using a terrestrial haulout. Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast, except when necessary for the safe operation of the vessel.

LS or ROP	Description of Objective	Requirement/Standard
LS K-6	*Goose Molting Area* Minimize disturbance to molting geese and loss of goose-molting habitat in and around lakes in the Goose Molting Area.	*General*: Within the Goose Molting Area, no permanent oil and gas facilities, except for pipelines, will be allowed within 1 mile of the shoreline of goose molting lakes. No waiver, exception, or modification will be considered. *Development*: In the Goose Molting Area, the following standards will be followed for permitted activities: a. From June 15 through August 20, all off-pad activities and major construction activities using heavy equipment (but not drilling from existing production pads) shall be suspended unless approved by the AO. b. Water extraction from any lakes used by molting geese shall not alter hydrological conditions that could adversely affect identified goose-feeding habitat along lakeshore margins. c. Oil and gas activities will avoid altering critical goose-feeding habitat types along lakeshore margins (e.g., grass, sedge, moss) and salt-marsh habitats. d. Permanent oil and gas facilities (including gravel roads, pads, and airstrips, but excluding pipelines) and material sites will be sited outside the identified buffers and restricted surface occupancy areas. e. Between June 15 and August 20, oil and gas facilities shall incorporate features (e.g., temporary fences, siting/orientation) that screen or shield human activity from view of any Goose Molting Area lake, as identified by the AO. f. Strategies to minimize ground traffic shall be implemented from June 15 through August 20. These strategies may include limiting trips, use of convoys, different vehicle types, etc. The permittee shall submit a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. g. Aircraft use shall be restricted from June 15 through August 20 unless doing so endangers human life or violates safe flying practices. Restrictions may include: (1) limiting flights to two roundtrips per week, and (2) limiting flights to corridors established by BLM. The permittee shall submit an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. h. Any permit for development will include a requirement for the permittee to conduct monitoring studies necessary to adequately determine consequences of development and any need for change to mitigations.
LS K-8	*Brant Survey Area* Minimize the loss or alteration of habitat for, or disturbance of, nesting and brood rearing brant in the Brant Survey Area. None of the area is available for oil and gas leasing or exploratory drilling.	a. Aerial surveys for brant nesting colonies and brood-rearing areas shall be conducted for a minimum of 2 years before authorization of construction of permanent facilities. The survey area shall include the proposed development site and the surrounding 0.5 mile area. b. Development may be prohibited, or activities curtailed within 0.5 mile of all identified brant nesting colonies and brood-rearing areas identified during the 2-year survey.

LS or ROP	Description of Objective	Requirement/Standard
LS K-9	*Teshekpuk Lake Caribou Habitat Area* Minimize disturbance and hindrance of caribou, or alteration of caribou movements through portions the Teshekpuk Lake Caribou Habitat Area that are essential for all season use, including calving and rearing, insect-relief, and migration.	In the Teshekpuk Lake Caribou Habitat Area, the following standards apply to permitted activities: a. Before authorization of construction , the permittee shall design and implement and report a study of caribou movement unless an acceptable study specific to the Teshekpuk Caribou Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Teshekpuk Caribou Herd movements. The study should provide information necessary to determine facility (including pipeline) design and location. b. Within the Teshekpuk Lake Caribou Habitat Area, permittee shall orient linear corridors when laying out developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities. c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required in the Teshekpuk Lake Caribou Habitat Area. d. Major construction activities using heavy equipment (but not drilling from existing production pads) shall be suspended within Teshekpuk Lake Caribou Habitat Area from May 20 through August 20, unless approved by the AO. e. The following ground and air traffic restrictions shall apply in the areas and time periods indicated: 1. From May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within 0.5 mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc. The permittee shall submit a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. 2. The permittee shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped: i. Temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. ii. By direction of the AO throughout a defined area for up to four weeks to prevent calving caribou displacement. 3. Major equipment, materials, and supplies to be used at work sites in the Teshekpuk Lake Caribou Habitat Area shall be stockpiled outside the period of May 20 through August 20.
LS K-10	*Teshekpuk Lake Caribou Movement Corridor* Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all-season use, including calving and rearing, insect-relief, and migration) in the area extending from the eastern shore of Teshekpuk Lake eastward to the Kogru River.	Within the Teshekpuk Lake Caribou Movement Corridor, no permanent oil and gas facilities, except for pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed.
LS K-11	*Southern Caribou Calving Area* Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving, post-calving, and insect-relief) in the area south/southeast of Teshekpuk Lake.	Within the Southern Caribou Calving Area, no permanent oil and gas facilities, except pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed.

LS or ROP	Description of Objective	Requirement/Standard
LS K-12	*Colville River Special Area* Prevent or minimize loss of raptor foraging habitat (also see LS K-1).	If necessary to construct permanent facilities within the Colville River Special Area, all reasonable and practicable efforts shall be made to locate permanent facilities as far from raptor nests as feasible. Additionally, within 15 miles of raptor nest sites, significant alteration of high-quality foraging habitat shall be prohibited unless the lessee can demonstrate on a site-specific basis that impacts would be minimal. Of particular concern are ponds, lakes, wetlands, and riparian habitats. Note: On a case-by-case basis, essential pipeline and road crossings will be permitted where no other feasible or prudent options are available.
ROP L-1	Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.	On a case-by-case basis, BLM may permit low-ground-pressure vehicles to travel off of gravel pads and roads during times other than those identified in ROP C-2a. Permission for such use would only be granted after an applicant has: a. Submitted studies satisfactory to the AO of the impacts on soils and vegetation of the specific low-ground-pressure vehicles to be used. b. Submitted surveys satisfactory to the AO of subsistence uses of the area as well as of the soils, vegetation, hydrology, wildlife and fish (and their habitats), paleontological and archaeological resources, and other resources as required by the AO. c. Designed and/or modified the use proposal to minimize impacts to the AO's satisfaction. Design steps to achieve the objectives may include, timing restrictions, shifting of work to winter, rerouting, and not proceeding when certain wildlife are present or subsistence activities are occurring. At the discretion of the AO, the plan for summer tundra vehicle access may be included as part of the spill prevention and response contingency plan.
ROP M-1	Minimize disturbance and hindrance of wildlife, or alteration of wildlife movements through the NPR-A.	Chasing wildlife with ground vehicles is prohibited. Particular attention will be given to avoid disturbing caribou.
ROP M-2	Prevent the introduction, or spread, of non-native, invasive plant species in the NPR-A.	Certify that all equipment and vehicles (intended for use either off or on roads) are weed-free prior to transporting them into the NPR-A. Monitor annually along roads for non-native invasive species and initiate effective weed control measures upon evidence of their introduction. Prior to operations in the NPR-A, submit a plan for the BLM's approval detailing the methods for cleaning equipment and vehicles, monitoring for weeds, and weed control.
ROP M-3	Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.	If a development is proposed in an area that provides potential habitat for a BLM Sensitive Plant Species, the development proponent would conduct surveys at appropriate times of the summer season and in appropriate habitats for the Sensitive Plant Species that might occur there. The results of these surveys will be submitted to BLM with the application for development.
ROP M-4	Minimize loss of individuals of, and habitat for, mammalian species designated as Sensitive by BLM in Alaska.	If a development is proposed in an area that provides potential habitat for the Alaska tiny shrew, the development proponent would conduct surveys at appropriate times of the year and in appropriate habitats in an effort to detect the presence of the shrew. The results of these surveys will be submitted to BLM with the application for development.

Source: BLM 2022

Note: < (less than); ≤ (less than or equal to); ADF&G (Alaska Department of Fish and Game); AOGCC (Alaska Oil and Gas Conservation Commission); AO (authorized officer); BLM (Bureau of Land Management); dB re 20 µPa (decibels referencing 20 microPascal); DEC (Alaska Department of Environmental Conservation); EPA (U.S. Environmental Protection Agency); IAP (Integrated Activity Plan); LS (lease stipulation); NAAQS (National Ambient Air Quality Standards); NEPA (National Environmental Policy Act); NMFS (National Marine Fisheries Service); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure); USFWS (U.S. Fish and Wildlife Service); USGS (U.S. Geological Survey); VSM (vertical support member).

2.0 DESIGN FEATURES TO AVOID AND MINIMIZE IMPACTS

The Project proponent has incorporated measures to avoid and minimize impacts into the Project design. These are listed in Table I.2.1; the measures are part of the Project and were used to evaluate the impacts described in the Willow MDP EIS, Chapter 3.0, *Affected Environment and Environmental Consequences*. Some of these measures are similar to existing NPR-A LSs and ROPs or other requirements and are included to show the Project proponent's commitment to adhering to them. The Project proponent may propose additional measures in subsequent permitting phases.

Table I.2.1. Design Features to Avoid and Minimize Impacts*

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
1	Use directional drilling to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	ROP E-5; AOGCC	All
2	Construct road surfaces to the minimum width required for Project operations to minimize the placement of gravel fill: 32-feet-wide Willow access and BT1 and BT2 roads 24-feet-wide water source access pads roads, airstrip lighting roads, BT3, BT4 (Alternatives B, C, and D), and BT5 infield roads. Roads designed with a smaller top (crown) surface avoid additional fill placement where wider roads are not required.	Gravel infrastructure	ROP E-5; ADNR DMLW	All
3	Use 20-foot well spacing (instead of 30-foot well spacing) to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	ROP E-5; AOGCC; ADNR DMLW	Wetlands and vegetation
4	Share use of existing equipment and facilities (e.g., camps, seawater treatment plant, warehouses, maintenance shops, emergency response equipment) to reduce the overall Project gravel- and ice-pad footprint.	Gravel infrastructure	ROP E-5; ADEC	Water resources; wetlands and vegetation
5	Use single-season ice roads to support winter construction of gravel roads, pads, and pipelines to avoid the need for additional gravel roads for construction. This includes accessing Tiŋmiaqsiuġvik mine sites via ice road instead of gravel.	Gravel infrastructure, mine site	ROP E-5; ADNR DMLW	Wetlands and vegetation
6	Use 2:1 side slopes (i.e., gravel road and pad embankment slopes) instead of 3:1 to reduce the Project's overall gravel footprint.	Gravel infrastructure	ROP E-5	Wetlands and vegetation
7	Locate drill site BT4 (and associated roads and pipelines under Alternatives B, C, and D) outside of the Teshekpuk Lake Caribou Habitat area which would reduce the overall gravel footprint and eliminate the need for a bridged crossing of the Kalikpik River.	Gravel infrastructure, pipelines	LS K-9; ADNR DMLW; ADEC; AOGCC	Wetlands and vegetation; terrestrial mammals
8	Avoid permanently flooded wetlands by locating Project infrastructure on higher, and relatively drier areas, when practicable. This practice applies to drill sites and other pads, road alignments, the new airstrip, and other Project components.	Gravel infrastructure	None	Wetlands and vegetation; water resources
9	Suspend communications and power cables from horizontal support members to avoid additional fill associated with utility poles and to reduce the potential for bird strikes and perches for predators.	Utilities	ROP E-20	Wetlands and vegetation; birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
10	Use ice roads and pads, including multi-season ice pads, to support Project construction, including using ice pads to house construction camps; stage construction equipment; allow stockpiling of gravel and mine site overburden during construction activities; and support construction activities at bridge crossings, along the Project's pipeline alignment, at the HDD crossing of the Colville River, and at other locations as needed near the proposed infrastructure.	Construction activity	ROP E-5; ADEC; ADNR DMLW	All
11	Design pipelines to minimize redundant parallel pipelines to the extent practicable. (For example, infield pipelines from drill site BT2 would tie into drill site BT1 pipelines at BT1; and then drill site BT1 infield pipelines would connect with the WPF. Additionally, the Willow export pipeline would tie into the existing Alpine Sales oil pipeline at a tie-in pad near Alpine CD4N to connect the Project to the Trans-Alaskan Pipeline System.)	Pipelines	ROP E-7; AOGCC; ADEC	Wetlands and vegetation; birds; terrestrial mammals; spill risk
12	Colocate the WPF with drill site BT3 to eliminate the need for an additional gravel pad and associated gravel fill (Alternative D only).	Gravel infrastructure	ROP E-5; AOGCC	Wetlands and vegetation
13	Construct oil and gas facilities and other Project infrastructure more than 500 feet from fish-bearing waterbodies, to the maximum extent practicable. Only essential pipeline road crossings are proposed for the Project that would encroach on this minimum distance. (For example, the intersection between the BT1 and BT3 access roads was realigned and shifted west to locate the BT1 road outside of the 500-foot buffer of swale 2, an anadromous waterbody.) Construction camps would not be sited on frozen lakes or rivers. (Anticipated deviations are noted in the EIS.)	Gravel infrastructure, pipelines	ROP E-2; ADF&G; ADEC; ADNR DMLW	Water resources; fish
14	Consult with appropriate federal, state, and NSB agencies regarding the mine site design and reclamation plan. Design mine site to minimize impacts to wildlife, air quality, and water resources. Mine site operation and reclamation would include the storage and reuse of organic overburden (for the mine sites). Site the mine pits outside of the active floodplain to minimize impacts to water resources.	Gravel source	ROP E-8; ADF&G; ADEC; NSB; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; subsistence and sociocultural systems
15	Design, construct, maintain, and operate roads in ways to minimize environmental impacts and protect subsistence use areas and access. Gravel road alignments and pad layouts would consider topography, maintenance of natural drainage patterns, and the effects of spring breakup and other potential flood events. Road and pad layouts would also avoid ponds, lakes, and streams to the extent practicable.	Gravel infrastructure	ROP E-1; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; subsistence and sociocultural systems

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
16	Restrict summer tundra vehicle travel for Project personnel to emergency response or to permitted activities required by statute or regulation.	Personnel	ROP L-1; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
17	Conduct overland (i.e., tundra) moves and similar off-road or cross-country activity use in accordance with ROP C-2 to minimize impacts to streambanks, soil substrate, and vegetation.	Off-road vehicle use	ROP C-2; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
18	Use low-angle approaches for ice road waterway crossings to protect streambanks. Waterway crossings reinforced with additional snow or ice ("bridges") would be removed, breached, or slotted prior to spring breakup to maintain normal spring runoff patterns and fish passage. All constructed ice ramps and ice bridges would be substantially free of debris (e.g., sticks, brush).	Ice infrastructure	ROP C-3; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; fish; terrestrial mammals; marine mammals
19	Prohibit travel along streambeds unless it can be demonstrated that there would be no additional impacts from such travel to over-wintering fish or the invertebrates they rely on. Rivers, streams, and lakes would only be crossed with ice infrastructure at areas where waterbody or waterway ice has grounded, when practicable.	Ice infrastructure	ROP C-4; ADF&G; ADEC; ADNR DMLW	Water resources; fish
20	Inject produced water into the reservoir and do not discharge it to surface lands, surface waters, or marine waters.	Waste management	ROPs A-2 and A-7; ADF&G; ADEC	Water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems; public health
21	Use recent ecological mapping to assess wildlife habitat types to inform the design, placement, and development of permanent (i.e., gravel) infrastructure.	Gravel infrastructure	ROP E-12; ADF&G	Wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
22	Remove, slot, breach, or score ice road stream crossings prior to spring breakup to ensure adequate flow and drainage conditions at stream crossings.	Ice infrastructure	ROP C-3; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds
23	Place gravel roads perpendicular to the general flow direction when crossing natural drainages to maintain the existing flow patterns and characteristics.	Gravel infrastructure	ROP E-6; ADNR DMLW; ADF&G	Water resources; wetlands and vegetation; fish; birds
24	Design and construct stream and swale crossings to ensure the free passage of fish, minimization of erosion, maintenance of natural drainage characteristics, and the minimization of impacts to natural stream flow. Bridges would be used to cross rivers and major streams.	Gravel infrastructure	ROP E-6; ADF&G; ADNR DMLW	Water resources; wetlands and vegetation; fish; birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
25	Collect 3 years of hydrologic and fish data at stream crossing and ensure fish passage at stream crossings.	Gravel infrastructure	ROP E-14; ADF&G; ADEC	Fish
26	Design fish-passage culverts in consultation with ADF&G.	Gravel infrastructure	ADF&G; ADEC	Fish
27	Install cross-drainage culverts as needed to maintain natural surface drainage to mitigate the risk of sheet flow interruption and thermokarsting. The estimated spacing of culverts is approximately every 1,000 feet. (Exact placement would be adjusted based on a field survey of in-field local drainage patterns.)	Construction	ROP E-6; ADF&G	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
28	Place bridges and river crossings at narrow river sections, where practicable, to avoid gravel fill and minimize the number of piers/pilings placed below ordinary high water.	Gravel infrastructure	ADF&G	Water resources; wetlands and vegetation; fish
29	Construct bridge abutments from sheet pile to reduce the overall gravel footprint and protect the structures from embankment erosion and stream scour.	Construction	ROP E-6; ADF&G; ADEC	Soils, permafrost, and gravel resources; water resources; fish
30	Do not stockpile gravel in Waters of the U.S., including wetlands. Gravel would be stockpiled in upland areas or on ice pads.	Gravel infrastructure	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
31	Install vertical support members (for pipelines) from ice roads and pads, and ensure drill cuttings are temporarily stored on ice and removed to the gravel mine site prior to spring breakup.	Construction	AOGCC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
32	Conduct trenching activity (e.g., pipeline road crossings) during winter and temporarily store trench materials on plywood, plastic sheeting, or an ice pad to avoid additional impacts to wetlands (e.g., fill).	Construction	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
33	Minimize heat transfer and impacts to permafrost from Project infrastructure on gravel pads by: designing flare stack height to reduce radiant heating; filling the gap between well conductors and inner pipes with polyurethane foam; using thermosyphons adjacent to well rows and at-grade structures; and installing insulation below the foundation floors of heated, at-grade structures.	Construction and operations	ADEC; ADNR	Soils, permafrost, and gravel resources
34	Elevate on-pad heated buildings or structures using pilings, to the extent practicable, to prevent or reduce heat transfer to underlying soils and preserve the thermal integrity of the permafrost.	Facilities	ADEC	Soils, permafrost, and gravel resources
35	Implement snow removal management measures to reduce the potential for gravel to be pushed off roads and pads during snow removal operations.	Construction and operations	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
36	Implement dust control measures for gravel roads, pads, and mining operations to reduce fugitive dust that can settle on vegetation or snow, which could increase thermal conductivity (i.e., reduce albedo), lead to thermokarsting, and promote earlier spring thaw in affected areas.	Gravel infrastructure	ROP A-10; ADEC	Soils, permafrost, and gravel resources; air quality; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; public health
37	Implement strict guidelines for travel on ice roads to avoid tundra damage, including requiring ice road driver training, establishing speed and weight limits, and installing road-edge delineators along both sides of roads.	Ice road travel	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
38	Install Colville River pipeline crossings (e.g., diesel, seawater) with insulation and placed within an outer pipeline casing, which would inhibit heat transfer to permafrost, contain fluids in the event of a pipeline leak, and provide structural integrity to the pipeline crossing.	Pipelines	ADEC	Soils, permafrost, and gravel resources; Water resources; Spill risk
39	Design, construct, and use ice roads that are a minimum of 6 inches thick during winter construction to eliminate or minimize impacts to wetlands and tundra.	Ice infrastructure	ROP C-2; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
40	Implement an erosion control plan to detail ways the Project would prevent or mitigate erosion that could impact terrestrial and aquatic environments. The plan would include CPAI's operations, monitoring, and maintenance procedures that detail the actions CPAI would undertake to monitor, maintain, and if needed, remediate gravel fill impacting surrounding tundra and wetlands.	Erosion control	ROP E-6; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
41	Place cleared (i.e., plowed) snow in designated snow-storage areas and manage stormwater from all gravel pads to prevent contaminants from being released during spring breakup. Select snow push areas annually based on avoiding areas of thermokarsting, proximity to waterbodies, and evaluations of areas used the previous year.	Snow management	ROP A-3; ADNR; ADEC	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
42	Use a minimum of 5-foot-thick section for gravel pads and roads to maintain a stable thermal regime by insulating the underlying tundra and offsetting the loss of insulating effect caused by the compression of the vegetated tundra beneath the gravel.	Gravel infrastructure	ROP E-5; ADNR DMLW	Soils, permafrost, and gravel resources
43	Route ice roads to avoid shrub areas and large areas of tussock tundra to the extent practicable.	Ice infrastructure	ROP C-2; ADF&G; ADNR DMLW	Wetlands and vegetation; birds; terrestrial mammals
44	Construct pipelines aboveground, to the extent practicable, to minimize permafrost impacts.	Pipelines	ADEC; ADNR	Soils, permafrost, and gravel resources

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45	On BLM-managed lands, withdraw unfrozen water from lakes and not rivers and streams during winter to maintain populations of, and adequate habitat for, fish and invertebrates. Ice aggregate would not be removed from areas of grounded ice less than or equal to 4 feet in depth (on BLM-managed lands) without authorization from the BLM, on a site-specific basis.	Water withdrawal	ROP B-1; ADNR DMLW; ADEC	Water resources; fish
46	Do not construct causeways or docks in any river mouth or delta. Causeways, docks, artificial islands, or other bottom-fast structures, if employed, would be designed to ensure free passage of fish and prevent changes to water circulation patterns or water quality.	Gravel infrastructure	ROP E-3; ADNR DMLW; ADF&G	Water resources; fish; birds
47	Maintain air-traffic altitudes consistent with NPR-A ROP F-1, except during takeoffs and landings, and unless doing so would endanger human life or violate safe flying practices, to avoid disturbing caribou, birds, and subsistence users, when feasible. (Some air traffic would be required to support the Project or for regulatory compliance [e.g., wildlife studies, hydrology studies] and to ensure cleanup following the ice-road season could require flying at lower altitudes.)	Air traffic	ROP F-1; ADF&G	Noise; visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
48	Develop a bear-interaction plan for Project personnel to minimize conflicts between bears and humans.	All	ROP A-8; ADF&G	Terrestrial mammals; marine mammals
49	Minimize disruption to caribou movement by maintaining a minimum clearance of 7 feet between the bottom of pipelines and the ground surface.	Pipelines	ROP E-7; ADF&G; ADEC	Terrestrial mammals; subsistence and sociocultural systems; spill risk
50	Design facilities to minimize nesting, denning, or sheltering opportunities for ravens, raptors, and foxes. Prohibit intentional feeding of wildlife.	Facilities	ROP E-9; ADF&G	Birds; terrestrial mammals
51	Minimize the amount of light visible from outside of facilities, including directing artificial exterior lighting inward and downward during all months of the year, which would prevent waterfowl (including species listed under the ESA) from striking facilities during low light conditions.	Facility lighting	ROP E-10; typical ESA conservation measure; ADF&G	Birds
52	Minimize the take of species, particularly those listed under the ESA and BLM Special Status Species, by conducting eider and yellow-billed loon surveys and working with resource agencies to ensure facilities minimize impacts to species found (e.g., ensure off-pad utility lines are either buried or suspended from pipe racks to the extent feasible, locate towers on pads near existing buildings to the extent feasible, minimize the use of tower guy wires, clearly mark guy wires that are used to prevent collisions).	Facilities	ROPs E-11 and J; typical ESA conservation measure; ADF&G	Birds

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
53	Develop a new gravel mine site that would not result in the loss of raptor nesting habitat because it would not take gravel from cliffs, river channels, or stream channels in a manner that would affect river bluffs.	Gravel source	ROPs E-8 and E-15; ADF&G	Birds
54	Minimize the electrocution hazard by suspending electrical distribution lines from pipe racks or burying cables (versus the use of overhead power lines) off pad.	Utilities	ROP E-20; typical ESA conservation measure; ADF&G	Birds
55	Provide the BLM authorized officer with GIS-compatible location information to facilitate agency monitoring and assessment of wildlife movements through the Project area after Project construction.	Facilities	ROP E-19; ADF&G	Birds; terrestrial mammals
56	Locate pipelines parallel to new and existing gravel roads and maintain a minimum separation distance of 500 feet, where feasible, to minimize caribou disturbance and prevent excessive snow accumulation from snowdrifts and snow removal.	Pipelines	ROP E-7; ADF&G	Terrestrial mammals; spill risk
57	Contract with a state-registered Primary Response Action Contractor to assist with quick spill response impacts in the event of a spill.	Operations	ROP A-4; ADEC	Spill risk
58	Align pipe racks installed adjacent and parallel to existing pipeline racks so vertical support members for each pipe rack are in line, to the extent practicable, to reduce obstructions to caribou and subsistence user movements.	Pipelines	ADNR	Birds; terrestrial mammals; subsistence and sociocultural systems
59	Use a muted (i.e., non-reflective) coating on pipelines to avoid glare.	Pipelines	ADNR	Visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
60	Implement policies, procedures, and training to prevent wildlife attraction to Project facilities, including use of predator-proof dumpsters for food waste collection; a strict policy prohibiting the feeding of wildlife; and the use of Ziploc bags or other sealed containers for meals-on-the-go to conceal food odors.	Waste management and wildlife interaction	ROPs A-8 and I-1; ADEC	Birds; terrestrial mammals; marine mammals
61	Implement a Wildlife Avoidance and Interaction Plan that would include procedures to eliminate, minimize, and mitigate bear interactions. CPAI conducts training on waste management practices and would conduct Project-specific training on waste management to guide employees and contractors on managing predators.	Waste management	ROPs A-1, A-2, A-8, and I-1; typical ESA conservation measure; ADF&G; ADNR; ADEC	Birds; terrestrial mammals; marine mammals
62	Protect grizzly and polar bear denning sites by prohibiting cross-country travel or use of heavy equipment within 0.5 mile of a grizzly bear den and within 1.0 mile of a polar bear den. Where necessary, CPAI would conduct surveys near coastal areas to locate potential polar bear dens, in consultation with the U.S. Fish and Wildlife Service, as appropriate, before initiating activities in coastal habitat between October 30 and April 15.	All	ROP C-1; typical ESA conservation measure; ADF&G; ADNR DMLW	Terrestrial mammals; marine mammals

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
63	Conduct training for Project personnel on NPR-A ROPs, standards, and environmental, social, traditional, and cultural concerns specific to the Project region, including training on community interactions. This training would be designed to ensure strict compliance with local and corporate drug and alcohol policies.	Personnel	ROP I-1; NSB	Subsistence and sociocultural systems; cultural resources
64	Prohibit Project employees from hunting and trapping activities while employees are on active work status to avoid increased competition for subsistence and recreational wildlife resources.	Personnel	ROP H-3; ADF&G	Subsistence and sociocultural systems
65	Use the results of cultural and paleontological resource surveys to inform Project design and facilities placement. The Project would avoid known cultural and paleontological resources during ground-disturbing activities, including the construction of ice roads.	Construction	ROP E-13; ADNR	Cultural and paleontological resources
66	Implement a Visual Resources Management Plan to minimize visual resource impacts, consistent with the Visual Resources Management Class for the lands on which Project facilities would be located.	Project infrastructure	ROP E-17; ADNR	Visual resources
67	Avoid disturbance of caribou and strictly prohibit chasing wildlife with vehicles.	Personnel	ROP M-1; ADF&G	Birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
68	Continue to consult with affected subsistence communities, tribes, Alaska Native Corporations, and NSB, as well as the Kuukpikmuit Subsistence Oversight Panel, Alaska Eskimo Whaling Commission, Nuiqsut Whaling Captains, and Barrow Whaling Captains to mitigate potential impacts to subsistence activities. Plans would be maintained to ensure these consultations continue both periodically and robustly.	All	ROP H-1; NSB	Subsistence and sociocultural systems
69	Continue to consult with the Kuukpik Subsistence Oversight Panel, the Native Village of Nuiqsut, and Kuukpik Corporation to ensure Project activities do not adversely affect subsistence activities. CPAI would continue to hold frequent public community meetings well in advance of future activities. Travel would be scheduled with flexibility and managed through the use of speed limits, rerouting, and traffic stoppages to avoid conflict with subsistence use and hunting areas during seasonal periods.	All	ROPs E-1, F-1, H-1, H-3, and I-1; NSB	Subsistence and sociocultural systems
70	Continue to provide annual funding for the Kuukpik Subsistence Oversight Panel to help support the executive director and coordinate panel activities.	All	ROPs E-1, F-1, H-1, H-3, and I-1; NSB	Subsistence and sociocultural systems
71	Conduct high-disturbance construction activities such as gravel mining and placement, and pipeline and facility construction, primarily during the winter months when subsistence activity levels are relatively low and disruptions to water flows can be minimized.	Construction	ADF&G	Water resources; fish; birds; terrestrial mammals; subsistence and sociocultural systems

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
72	Include subsistence tundra access ramps and pullouts on gravel roads with locations based on community input. The pullouts would allow local residents to access the areas adjacent to roadways. The tundra access ramp and pullouts would be designed with considerations of lessons learned from the Greater Mooses Tooth 1 and 2 projects.	Gravel infrastructure	ADNR DMLW; NSB	Subsistence and sociocultural systems
73	Prohibit the use of airboats on rivers within BLM-managed lands and within a 50-mile radius of Nuiqsut, except for emergencies and emergency response training.	Operations	ADNR DMLW; ADF&G	Noise; birds; fish; terrestrial mammals; marine mammals; subsistence and sociocultural systems
74	Continue the internship program (CareerQuest) to introduce Nuiqsut high school students to jobs and careers in the oil fields and in their community.	Community outreach	NSB	Economics; subsistence and sociocultural systems
75	Continue to strive to hire qualified Nuiqsut, NSB, and Alaska residents for oil field jobs.	Personnel	NSB	Economics
76	Ensure current communications protocols for CPAI helicopter, fixed-wing aircraft, and marine-vessel traffic are adequate to address community (Nuiqsut) concerns about traffic-related impacts to subsistence activities.	Air and vessel traffic	ROP F-1; NSB	Subsistence and sociocultural systems
77	Allow Nuiqsut residents reasonable use of Project roads to access subsistence areas throughout the life of the Project.	Gravel infrastructure	ROPs E-1 and H-1; NSB; ADNR DMLW	Subsistence and sociocultural systems
78	Implement avoidance measures to ensure protection of cultural resource sites during Project activity by establishing a 500-foot avoidance buffer consistent with NSB regulations.	All	NSB	Cultural resources
79	Reduce and minimize air pollution through air quality monitoring and modeling, as appropriate. Develop an emissions inventory and apply additional mitigation measures and activity modifications, as appropriate, in response to the air quality information generated. Make reports generally available to the NSB and local communities.	Air emissions	ROP A-10; ADEC; NSB	Air quality; public health
80	Adhere to the BLM's oil and gas air resources ROPs, as applicable. These practices would minimize air emissions resulting from both Project construction and operations and would include: watering gravel roads to minimize fugitive dust, using clean fuels such as ultra-low sulfur diesel and natural gas, and the use of low emissions emitting equipment (including maximum use of electrical power, Tier IV final engines - or similar emission reduction technology for drill rigs and hydraulic fracturing equipment prior to WPF facility startup – storage tank closed vent systems to the extent practicable, and green completions).	All	ADEC	Air quality; climate change; water resources; wetlands and vegetation; public health
81	Use ultra-low sulfur diesel fuel (as defined by ADEC) in all diesel-fueled vehicles and equipment.	Vehicles and equipment	ROP A-9; ADEC	Air quality; public health

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
82	Use totally enclosed or acoustically packaged permanent electric power generator sets to abate noise.	Generators	ADEC	Noise; birds; terrestrial mammals; marine mammals
83	Generate Project power using the power plant at the WPF following facility startup and provide power to drill rigs except during periods when power from the WPF is unavailable. Use ultra-low-sulfur diesel powered portable generators to supply Project power prior to facility startup or during periods of facility maintenance, shutdown, or upsets.	Utilities	ADEC; AOGCC	Air quality; public health
84	Power off vehicles and heavy equipment (i.e., rolling stock) used for oil and gas operations when not in active use, to the extent practicable.	Vehicles	ROP A-7; ADEC	Air quality; climate change; public health
85	Equip vehicles with block heaters and institute Project practices to power off and plug in vehicle engines when temperatures are -30°F or above to conserve fuel and reduce emissions.	Vehicles	ADEC	Air quality; climate change; public health
86	Use Finewater Mist for process module fire protection and a non-ozone depleting agent for drill site and non-process module fire protection in lieu of Halon.	Fire protection	ADEC	Air quality; water quality
87	Manage all waste in accordance with a comprehensive waste management plan to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. This would be accomplished using the Alaska Waste Disposal and Reuse Guide (the "Red Book"). This guide addresses: waste prevention and reduction, recycling, treatment, and disposal. The waste management plan would include measures to avoid attracting wildlife, disposal of putrescible waste, disposal of pumpable waste, and disposal of wastewater. As allowed, injectable waste would be injected into the subsurface via disposal wells or used for enhanced oil recovery.	Waste management	ROP A-2; ADEC	Water resources; wetlands and vegetation; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
88	Audit contractors' health, safety, and environment performance to ensure safe practices are followed.	Personnel	ADEC	Water resources wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence; public health
89	Audit the Project on a scheduled basis to ensure compliance with all environmental laws, regulations, and local requirements, company policies and procedures, and other regulations regarding safety, land use, fire codes, etc.	All	ADNR DMLW; ADEC	All
90	Employ Field Environmental Coordinators to monitor compliance with permits and other Project requirements.	All	ADNR	All
91	Evaluate environmental considerations when purchasing new storage tanks or adding new emissions sources that may affect the environment or operating permits.	All	ROP A-10; ADEC	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
92	Review new chemicals being considered for use on the Project to ensure the materials would minimize the generation of hazardous waste or risk to employees.	Operations	ROP A-3; ADEC	All
93	Develop and implement a spill prevention and response contingency plan for the Project (in accordance with 40 CFR 112) to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. The Plan would cover Project operations and describe spill prevention measures and on-site cleanup materials for permanent fueling stations, use of proper storage containers and liner materials, proper container identification, and notice of reportable spills. Identification of drip pans (i.e., "duck ponds") would be addressed through Project operating procedures.	Spill prevention and response	ROP A-4; ADEC	All
94	Use a hazardous materials contingency plan (also known as a spill prevention and response contingency plan), prepared pursuant to NPR-A ROP A-3, that would detail response actions, drills, and responder training.	Spill prevention and response	ROP A-3; ADEC	All
95	Build and operate pipelines with the best available technology for detecting and preventing corrosion or mechanical defects to minimize impacts related to point source pollution from oil spills or leaks.	Pipelines	ROP E-4; ADEC	All
96	Install pipeline valves on each side of Judy (Kayyaaq) and Fish creek crossings, to allow isolation of produced fluids pipelines on either side of bridges and minimize potential spill impacts in the event of a leak or break. These valves would reduce subsistence user concerns related to downstream contamination from the Project. Isolation valves or vertical loops would be installed on the Willow (sales oil) pipeline at each side of the Ublutuoch (Tiŋmiaqsiuġvik) River, and on each side of the segment crossing the Nigliagvik Channel, Niġliq Channel, and lakes L9341 and L9323. Vertical loops would be installed on the diesel pipeline at each side of the Miluveach River, Kachemach River, and Colville River. Two methods of leak detection will be used for the seawater and diesel pipeline crossings under the Colville River: (1) leak detection mass balance (primary), and (2) optical leak detection (secondary, within casing).	Pipelines	ADEC	All
97	Implement CPAI's "Target Zero" spill prevention program, which is designed to raise awareness around spill prevention and pass on lessons learned, for the Project.	Spill prevention and response	ROP A-3, A-4, and A-5; ADEC	All
98	Implement a fuel transfer standard operating procedure and use secondary containment on regulated oil and hazardous materials storage tanks.	Spill prevention and response	ROPs A-4 and A-5; ADEC	All

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
99	Continue to implement an extensive corrosion inspection program which includes ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss detection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared (heat signature detection) technology. The inspection programs are American Petroleum Institute Standard 570-based programs that focus inspection efforts on areas of greatest potential for spills.	Spill prevention and response	ROP A-3; ADEC	All
100	Continue CPAI's operating practice to immediately and completely clean up all spills, recovering 100% of spilled material for recycling when possible.	Spill prevention and response	ROP A-3; ADEC	All
101	Periodically treat pipeline fluids, as appropriate to product types, with chemicals to limit corrosion potential.	Pipelines	ROPs A-3 and E-4; ADEC	All
102	Equip and maintain oil spill response equipment intended for use in winter conditions for effective use in Arctic conditions (i.e., in a manner to prevent the freezing or icing of the equipment).	Spill prevention and response	ROPs A-3 and A-4; ADEC	All
103	Hydrostatically test pipelines prior to placing them into operation.	Pipelines	ROP E-4; ADEC	All
104	Provide access to the GMT and Alpine developments (under Alternatives B, C, and E) to offer additional response capabilities and minimize response time in the event of a spill or other unintended release or emergency.	Spill prevention and response	ROPs A-3 and A-4	All
105	Stage spill response equipment in strategic locations (e.g., drill sites) for initial spill response. On-site staged equipment would facilitate the rapid deployment of response personnel and may minimize or reduce the overall impacts associated with a spill or other accidental release.	Spill prevention and response	ROPs A-3 and A-4; ADEC	All
106	Designate Spill Response Teams and Hazardous Materials Response Teams, consisting of trained volunteer spill and hazardous materials response personnel on site.	Spill prevention and response	ROP A-3; ADEC	All
107	Continue to participate in the Mutual Aid Agreement among North Slope operators to supply labor and equipment for immediate spill response. Spill response drills and exercises would ensure response readiness and awareness; these drills would be scheduled according to the National Preparedness and Response Exercise Program guidelines and typically involves production, drilling, or pipeline spill response scenarios	Spill prevention and response	ROP A-3; ADEC; NSB	All
108	Do not refuel equipment within 500 feet of the active floodplain of any waterbody unless approved by the BLM authorized officer. Fuel-storage stations, except as approved by the BLM authorized officer, would be located at least 500 feet from waterbodies except for small caches (up to 210 gallons) for fueling motorboats, float planes, and small equipment.	Spill prevention and response	ROP A-5; ADNR DMLW; ADEC	All

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109	Design well cellars to contain fluid drips and leaks.	Spill prevention and response	ROP A-4; ADEC	All
110	Continue philanthropy programs from local oil fields to provide income and other benefits to the residents of Nuiqsut.	All	None	Economics; sociocultural systems; public health
111	Design all bridges to maintain bottom chord clearance of at least 4 feet above the 100-year design flood elevation, or at least 3 feet above the highest documented flood elevation, whichever is higher. Additionally, design the Judy (Kayyaaq) Creek and Fish Creek bridges to maintain bottom chord clearance of at least 13 feet above the 2-year design flood elevation (open water) to provide vessel clearance.	Bridges	ROP E-6	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems; public health
112	Include construction of up to three subsistence boat ramps to provide local residents with improved river access. Locations would include the Ublutuoch (Tiŋmiaqsiuġvik) River near the existing GMT-1 access road, Judy (Kayyaaq) Creek at the proposed Willow BT1 access road crossing, and Fish Creek at the proposed access road crossing (BT4 under Alternatives B, C, and D; BT2 under Alternative E).	All	ROP E-1	Subsistence and sociocultural systems; public health
113	Implement a speed limit of 35 mph and stop traffic when caribou are crossing the road on all 32-foot-wide (surface width) roads. On roads with a 24-foot-wide surface width, implement a 25-mph speed limit for health, safety, and environmental purposes, including to reduce potential impacts to vegetation from dust and to wildlife.	Gravel infrastructure	None	All
114	Build a constructed freshwater reservoir to ensure a reliable source of fresh water for the Project while minimizing the need for water withdrawals from Willow-area lakes. Adaptively manage water levels by installing a flow control gate and valve to allow reduction of flow velocity into the reservoir based on monitoring of water levels in Lake M0015 and the lake outlet into Willow Creek if necessary.	Water withdrawal	None	Water resources; wetlands and vegetation; fish; birds
115	Place pipelines at Fish Creek and Judy (Kayyaaq) Creek on structural steel supports attached to the bridge girders below the bridge deck to avoid placement of pipeline VSMs below OHW.	Pipelines	LS K-1	Water resources; fish; birds
116	Remove the airstrip approach lighting access and secondary access roads from the proposed Project design to reduce the gravel footprint.	Gravel infrastructure	ROP E-5	All
117	Develop a module delivery option that uses the existing Oliktok Dock and staging pad to avoid the need to construct an MTI.	Gravel infrastructure, module delivery	ROP E-5	All
118	Minimize the footprint of the gravel mine based on amount of gravel needed (i.e., less gravel needed for Option 3).	Gravel infrastructure, mine site	ROP E-5	All

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119	Reduce potential fugitive methane emissions by processing and compressing produced gas for reinjection and gas lift to enhance production.	Pipelines	None	Air quality; Climate change
120	Minimize vented methane gas volumes by initially depressurizing pipelines to the production system, flare, and then purge lines with nitrogen prior to opening. By using nitrogen sweep and purge, little to no natural gas should be released when opening the equipment to atmosphere.	Pipelines	None	Air quality; Climate change
121	Use flaring to support process safety only (no flaring for production).	Processing facility	None	Air quality; Climate change
122	Use electric solenoids or instrument air driven pneumatics instead of natural gas driven pneumatics.	Processing facility	None	Air quality; Climate change
123	Use high efficiency turbines at the WPF (versus older frame style units employed at Prudhoe Bay and Kuparuk.	Processing facility	None	Air quality; Climate change
124	Use waste heat from the power generation turbines at the WPF to provide building and process heat for the WPF. No gas fired process heaters would be required during normal operations.	Processing facility	None	Air quality; Climate change
125	Use waste heat from fuel gas fired drill site heaters to supply building heat at drill sites to reduce electrical demand.	Drill site facilities	None	Air quality; Climate change
126	Prevent hydrocarbon emissions by installing vapor recovery units on hydrocarbon process tanks and vessels to prevent hydrocarbon emissions. (Note: these are process vessels and not storage vessels in the regulatory sense of the word. The infield flowlines, processing facility, and sales pipeline design obviate the need for permanent oil storage capacity onsite.)	Processing facilities and storage tanks	None	Air quality; Climate change
127	Use three-phase (gas, oil, and water) lines, which flow from each drill site to the Willow processing facility, and gas injection pipelines which flow from the Willow processing facility to each drill site, instead of gas gathering lines. Both types of overland pipelines have connections that are welded by design and largely avoid flanged connections minimize potential for leaks. These pipelines would employ the same leak detection surveys as the existing Alpine development (i.e., the lines will be surveyed in accordance with state regulations 18 AAC 75.080).	Pipelines	None	Air quality; Climate change; Spill risk
128	Conduct leak surveys (including methane) in accordance with New Source Performance Standard (40 CFR 60 OOOa or OOOOb [whichever regulation is applicable at the time]). Recycle the produced gas, not used for fuel or safety flare, and inject it for gas lift for reservoir pressure support (see also measure number 119).	Processing facilities and pipelines	40 CFR 60	Air quality; Climate change

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
129	Prior to WPF commissioning, use gas from the GMT-2 production pipeline to power the Willow Operations Center turbine via fuel gas rather than diesel fuel, which would produce less emissions than diesel fuel.	Processing facility	None	Air quality; Climate change
130	Use centrifugal compressors equipped with dry seals. Dry seal systems minimize methane leakage (versus wet seals).	Processing facility	None	Air quality; Climate change
131	Use electric power (from Project gas-fired turbines) for drilling and completion activities (e.g., drill rig and hydraulic fracturing equipment), versus using diesel fuel powered units.	Processing facility and drill site equipment	None	Air quality; Climate change
132	Capture and reinject produced gas during drilling, well completions, flowbacks, and well maintenance once the wellsite is connected by pipeline to the WPF to reduce combustion and methane emissions.	Processing facility and drill site equipment	None	Air quality; Climate change
133	Voluntarily comply with the Oil and Gas Methane Partnership, administered by the United Nations, which aims to improve methane measurements and drastically reduce methane emissions. As part of the program, the Willow Project would develop and implement methane measurement, reporting, and reduction plan, which would be subject to verification under the Oil and Gas Methane Partnership.	Processing facilities, drill sites, and pipelines	None	Air quality; Climate change
134	Implement a vehicle management plan (as required under the NSB rezoning ordinance), including traffic reduction measures.	Vehicles	None	Air quality; Climate change
135	Use mineral oil-based drilling muds where technically feasible to reduce vented methane emissions.	Well drilling	None	Air quality; Climate change
136	Use insulation in gravel roads and gravel pads where practicable to reduce the overall embankment height and gravel fill volume requirements while still maintaining thermal stability of the underlying permafrost.	Gravel infrastructure	NSB rezoning ordinance requirement	Permafrost and gravel resources; Terrestrial mammals; Subsistence

No.	Measure	Project Component or Activity	LS, ROP, or Other Stipulation[a]	Primary Affected Resource or Subject
137	CPAI will institute the following restrictions to ground-vehicle traffic in the Willow Project area (i.e., gravel and ice roads extending south/southwest from GMT-2): • The maximum speed limit on Willow gravel roads will be 35 mph to reduce the potential for vehicular accidents and disturbance of caribou. Infield roads that are 25 feet wide will have a maximum speed of 25 mph. • Periodic traffic closures will be instituted when groups of 25 or more caribou appear to be approaching the road and current traffic exceeds 15 vehicles per hour. • Wildlife will always have the right-of-way and vehicle traffic will be slowed or stopped to allow animals to cross Project roads. • Bus transportation will be used as the primary means to transport personnel between camps and their assigned work locations, as well as between camps and the Alpine CD1 airstrip during mobilization and demobilization.	Vehicles	None	Air quality; Birds; Terrestrial mammals; Subsistence
138	CPAI will institute the same safety access and use guidelines for Project roads as the operating Alpine development and Greater Mooses Tooth facilities.	Gravel roads	None	Subsistence

Note: °F (degrees Fahrenheit); ADEC (Alaska Department of Environmental Conservation); ADF&G (Alaska Department of Fish and Game); ADNR (Alaska Department of Natural Resources); AOGCC (Alaska Oil and Gas Conservation Commission); BLM (Bureau of Land Management); BT1 (Bear Tooth 1 drill site); BT2 (Bear Tooth 2 drill site); BT3 (Bear Tooth 3 drill site); BT4 (Bear Tooth 4 drill site); BT5 (Bear Tooth 5 drill site); CPAI (ConocoPhillips Alaska, Inc.); DMLW (Division of Mining, Land, Water); EIS (Environmental Impact Statement); ESA (Endangered Species Act); GIS (geographic information system); GMT-1 (Greater Mooses Tooth 1); GMT-2 (Greater Mooses Tooth 2); HDD (horizontal directional drilling); LS (lease stipulation); mph (miles per hour); MTI (module transfer island); No. (number); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); OHW (ordinary high water); ROP (required operating procedure); VSM (vertical support member); WPF (Willow Processing Facility). All cited lease stipulations and required operating procedures are from the National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement Record of Decision (BLM 2022).

[a] Other stipulations include typical State of Alaska or NSB permit stipulations for North Slope activities or typical ESA conservation measures or LSs or ROPs. The table lists the agency from which the typical stipulation would arise.

3.0 ADDITIONAL SUGGESTED AVOIDANCE, MINIMIZATION, OR MITIGATION CONSIDERED IN THE 2020 WILLOW EIS

In addition to Project design features, LSs, and ROPs already applicable to the Project, the EIS also considers additional suggested avoidance, minimization, and mitigation measures designed to further reduce or compensate for impacts from the Project. These measures are discussed in the relevant resource sections in both the Willow MDP Final EIS (2020), Chapter 3.0, *Affected Environment and Environmental Consequences,* and this Willow MDP Supplemental EIS and are summarized in Table I.3.1. They were developed based on suggestions from cooperating agencies, stakeholders, public comments, and BLM staff.

The decision whether to adopt each new measure will be made in the BLM's Willow MDP ROD.

Table I.3.1. Additional Suggested Avoidance, Minimization, or Mitigation

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.2 – Climate and Climate Change	None
3.3 – Air Quality	Implement a Fugitive Dust Control Plan to mitigate impacts from fugitive particulate matter emissions from the Project. This plan would require regular watering of pads and unpaved roads, enforcing speed limits on unpaved access and haul roads, and several other measures to reduce fugitive dust emissions and impacts. See Appendix I.3, *Dust Control Plan*, for additional details.
3.4 – Soils, Permafrost, and Gravel Resources	Use the following in design of roads and embankments: • Separate native soils from Project fill materials using geotextiles or fabrics • Use thick embankments and shallow slopes • Monitor thermokarsting, depth of active layer, and compression of soil and vegetation in annual resupply ice road footprint, for footprints that are used consecutively each year
3.5 – Contaminated Sites	None
3.6 – Noise	Alter flight paths to avoid sensitive areas (such as Nuiqsut) Limit blasting to the hours of 10:00 a.m. to 8:00 p.m.
3.7 – Visual Resources	Include the following in the plan to minimize visual impacts (plan is required as per ROP E-17): • Ensure structures are a color that blends in with the background colors of the natural landscape. All colors would be pre-approved by the BLM. • ROP E-7 and CPAI's design measure 58 (Appendix I.1, Table I.1.2) state that a non-reflective coating would be used on pipelines; that could be expanded to all metal structures not otherwise painted, including but not limited to communications towers and drill rigs. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings. This will minimize impacts on visual aesthetics (i.e., reduce contrast from glare and artificial lighting).
3.8 – Water Resources	Appendix E.8 provides detail about culvert, bridge, and pipeline design and how that influences potential effects to water resources. Additional suggested measures to reduce impacts created by culvert, bridge, and pipeline crossings, could include: Unless a more appropriate method is available, when estimating flood-peak discharge at locations within the Fish (Iqalliqpik) Creek, Judy (Iqalliqpik) Creek, and Ublutuoch (Tiŋmiaqsiġvik) River basins, use a weighted average from a single station analysis of the BLM long-term monitoring station data on each of these streams and the Shell regression equations (Appendix E.8). Weight the results of the two computations based on the uncertainty associated with each estimate. As appropriate, consider both 1) snow- and ice-impacted conditions and 2) ice-free conditions in the hydraulic design of bridges, culverts, and pipeline river crossings. Cross-section data at the time of the peak stage and peak discharge that are available for many rivers and streams indicate that the WSE was affected by snow and/or ice blockage. Based on the available information, develop designs that would perform satisfactorily during the design event considering both the possibility of open water conditions and the possibility that snow and ice blockage is occurring at the time of the design event. At a minimum, the magnitude of the blockage used in the designs should be similar to the magnitude of the blockage that has been observed. At a minimum, design culverts to perform satisfactorily for all flood events up to and including the 50-year event. The headwater-to-diameter ratio at the maximum design condition should be no greater than 1.0.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
	Identify the locations requiring cross-drainage culverts during spring breakup prior to construction, by noting all locations where water is flowing over the proposed alignment. This is necessary because it is often not possible to determine where water flowing in polygon troughs will cross the alignment during a summer or fall inspection. At the same time, identify the ends of the proposed culverts and the invert elevation of the ends of the culvert in order to maintain the flow in the historic flow path. At a minimum, design road bridges to pass the 50-year flood-peak discharge with a minimum of a 3-foot freeboard (assuming snow and ice conditions have been considered in estimating the design water surface elevation). Design for bridge foundation scour equal to the maximum scour depth produced by floods up through a magnitude equal to the 100-year flood event, and a geotechnical design practice safety factor of from 2 to 3. Check the bridge design using a superflood and a geotechnical design practice safety factor of 1. The superflood is defined as the 500-year event, 1.7 times the magnitude of the 100-year event, or the overtopping flood, whichever is the least. These are standard criteria used by Alaska Department of Transportation and Public Facilities for bridges on the North Slope in non-designated flood hazard areas. At a minimum, design pipeline river-crossings to perform satisfactorily for all floods up to and including the 200-year event (including crossings on bridges or VSM). This is the magnitude of the design event that has typically been used for common carrier pipelines on the North Slope and a higher level of design than is being proposed for the Project. Start bridge and culvert hydraulic computations sufficiently downstream so that the downstream boundary assumptions do not affect the performance of the proposed design. Consider the USACE (1986) report "Accuracy of Computed Water Surface Profiles" in determining the location of the downstream boundary for hydraulic computations. If the highest observed WSE or high-water mark is higher than the predicted 50-year WSE at a culvert, bridge, or pipeline, re-evaluate the design water surface elevation to confirm that snow and ice blockage, and other details of the computation are accurate. Given the conditions on the North Slope, it is unlikely that high water marks from a 50-year flood or greater would be recognizable unless it occurred in the last 10 to 20 years. Additionally, it is improbable that a 1- to 5-year field program would experience a 50-year flood. It is more likely that snow and ice blockage greater than accounted for in the model used to predict the 50-year WSE or an error in the downstream boundary condition used in the model has occurred. Use a freeboard at bridges and pipeline crossings which considers the uncertainty in the magnitude of the design flood, the uncertainty in the hydraulic computations, and the height of the ice and debris that may be carried by the flood but is not less than 3 feet. Where an aboveground pipeline crossing is *immediately* upstream from a road, backwater from the road during the pipeline design event should be considered when setting the bottom of pipe elevation. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in location of the concentrated flow and the impact on erosion at the VSM). Where an aboveground pipeline crossing is *immediately* downstream from a road, the impact of the road on where water would be flowing and the velocity of the water at the pipeline VSM should be considered. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in the location of the concentrated flow and the impact on erosion at the VSM). Breach ice road crossings sufficiently that ice from crossing would not contribute to ice jams or increase snow and ice blockage during spring breakup. Avoid placing multi-season ice pads in floodplains (e.g., construction pads at the mine site). Prior to HDD construction, provide a monitoring and response plan for determining if drilling mud is being lost to formation or making it to the river or groundwater during drilling. Should any spills occur on the MTI, the affected gravel would be addressed immediately and removed prior to MTI abandonment. If Option 1 or 2 is selected, place and maintain appropriate navigation aids on the MTI after it is decommissioned (the top of the MTI is expected to drop to or below the water surface) Provide annual surveillance of bridge, culvert, and pipeline river crossings to confirm that structures are functioning properly and provide maintenance as required.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
	Continue to collect baseline data regarding discharge, ice and liquid water conditions and distribution, and bank conditions on the Colville River near Ocean Point throughout winters every year until ice bridge construction so that an ice bridge plan can be drafted that would include exact crossing location for bridge and ramps, plans for flow and fish passage management (should they be needed), and actions to be taken at the end of ice bridge use (such as slotting). Prepare an adaptive management plan that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts. Include erosion mitigation features or options in engineering design of boat ramp(s) to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks. Develop a maintenance plan for the boat ramps to ensure long-term viability and use of the site(s) while minimizing impacts to the adjacent waterbodies. Include the following points at a minimum: • Identify entity responsible for site maintenance • Annual maintenance (grading) of parking pads, turning pads, access ramps, and road access • Maintain a gravel supply (off-site) to reinforce boat ramps and pads when necessary • Regular clean-up of pads and surroundings, including back-haul of trash to suitable disposal site Before construction and continuing through operations, test and monitor freshwater sources that intersect the Project for hydrocarbons.
3.9 – Wetlands and Vegetation	If Alternative C or D is selected, monitor vegetation damage, and compression of soil and vegetation in annual resupply ice road footprint (footprints that are used consecutively each year). Because wetter landscapes show less impact from multiyear ice roads (Yokel, Huebner et al. 2007) and ADNR monitors only tussock tundra and soil compaction, this suggested measure would focus on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss) and percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes. Use vehicle and equipment wash stations and inspect vehicles and equipment for organic matter (e.g., invasive species) prior to moving equipment west of the Colville River to reduce the risk of introducing invasive species. Clean tires and wheel wells so they are free from soils, seeds, and plant parts. Provide stations to clean footwear and gear so they are free from soils, seeds, and plant parts. Provide training to employees and contractors in identification, control, and prevention of known invasive plant species. Confine loading and unloading of soils for gravel stockpiles to the downwind side of the pile; if piles would be on-site for longer periods of time, seed with appropriate vegetation to reduce wind erosion. Wind barriers (such as snow fences) may also be appropriate in some situations.
3.10 – Fish	Identify overwintering fish habitat (maximum water depths, particularly free-water depth under ice cover) in the Itkillik River and other tributaries to the Colville River that might intersect the Option 3 ice road. Avoid crossings of potential overwintering habitat. Adopt best management practices suggested by National Marine Fisheries Service for essential fish habitat for invasive species (Limpinsel, Eagleton et al. 2017): • Uphold fish and game regulations of the Alaska Board of Fisheries (AS 16.05.251) and Board of Game (AS 16.05.255), which prohibit and regulate the live capture, possession, transport, or release of native or exotic fish or their eggs. • Adhere to regulations and use best management practices outlined in the State of Alaska Aquatic Nuisance Species Management Plan (ADF&G 2002). • Encourage vessels to exchange ballast water in marine waters (in accordance with the U.S. Coast Guard's voluntary regulations) to minimize the possibility of introducing invasive estuarine species into similar habitats. Ballast water taken on in the open ocean would contain fewer organisms, and these would be less likely to become invasive in estuarine conditions. • Discourage vessels that have not exchanged ballast water from discharging their ballast water into estuarine receiving waters.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.11 – Birds	Locate mast poles away from the pad edge. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings to minimize the potential for bird strikes. Implement lighting controls to turn off exterior lighting at satellite pads and other unoccupied facilities when personnel are not present, between August 1 and October 31. Minimize the number of tall towers. Limit water withdrawal to lakes without sensitive fish or breeding yellow-billed loons. Route ice roads around identified yellow-billed loon nesting sites and nesting lakes to avoid vegetation compaction at nesting sites and delayed melt-out of nesting lakes. Restrict speed limits to minimize collision hazard and dust production (35 miles per hour except in areas of congestion, on bridges, and on pads, which should be slower). Haze birds out of the blast area before blasting (if resident birds are present in winter). Minimize noise impacts between June 1 and July 15 when birds on nests would be unable to move away from the disturbance. Minimize air traffic during the nesting period when the movements of incubating birds are restricted, and the molting period when birds may be energetically stressed and sensitive to disturbance. Avoid routine use of helicopters during drilling and operations activities to minimize noise and impacts related to birds. Consider revising traffic patterns, altitude, and location to minimize conflicts with molting geese. Avoid preferred habitats, where possible. Minimize barge and support vessel speed to reduce potential for bird strikes. Complete upgrades to the Kuparuk gravel road system involving wetland fill before or after the nesting season (June 1 through July 31), if possible.
3.12 – Terrestrial Mammals	ROP E-6 describes requirements related to caribou ramps over pipelines or buried pipelines. The Project could designate specific locations for these, such as northeast of the airstrip in Alternative B, or areas where caribou movements could be funneled or where roads and pipelines would be close together. The decision to add a crossing ramp over a buried pipeline should consider potential negative effects of reduced access to the pipeline for oil spill detection and response and thermokarst or changes in surface flow due to the resulting long-linear ditch that would fill with water. Install game cameras to study the effectiveness of measures used to reduce vehicle traffic impacts, such as stopping traffic or caravanning. Include the following in the vehicle use plan to minimize traffic impacts (plan is required as per ROP M-1): • Require vehicles to stop traffic when 25 or more caribou appear to be approaching the road. • Require vehicles to caravan or require periodic traffic closures when groups of caribou are near a road and the road has traffic rates of more than 15 vehicles per hour. Caravanning has limited ability to lower calving displacement (Lawhead, Prichard et al. 2004), but it may increase crossing success on roads with high traffic levels (more than 15 vehicles per hour) by providing periods without traffic to allow caribou to cross. It may be easier logistically to close the road for a specified number of hours a day (as determined by BLM) rather than caravanning. Spring, fall, and winter would likely be the periods of greatest concern for caribou crossing Project roads. Restrict Q400 traffic between Alpine and Willow at certain times of year to reduce impacts to caribou. Require the use of propylene glycol for deicing and for vehicle cooling systems, which is not toxic to wildlife.
3.13 – Marine Mammals	None
3.14 – Land Ownership and Use	Develop a coordination plan with other stakeholders who are permitted to use the NSB Community Winter Access Trail snow road (i.e., Nuiqsut residents) by BLM to prevent access conflicts during sealift module movement across the Colville River.
3.15 – Economics	None

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.16 – Subsistence and Sociocultural Systems	Inform employees who are North Slope residents of company subsistence leave policies and ensure that leave policies are flexible to account for annual variation in the timing and length of subsistence activities. Employ subsistence representatives who receive daily communications on Project activities and report potential conflicts with subsistence users. Subsistence representatives should be provided with clear communication protocols and training, be local and knowledgeable residents, and be included in field activities the community believes have a high potential of conflicting with subsistence uses (e.g., helicopter-based surveys). In coordination with local organizations, such as the KSOP (required in CPAI design measure 68), ensure communications include the timing and location of development activities such as air traffic, blasting, and other construction activities. Identify areas with high drifted snow accumulation along pipelines after construction and implement a snow management program to clear drifts and create access points (i.e., openings) in areas where drifts accumulate for a long distance (e.g., quarter- and half-mile lengths) along pipelines. Consult with Nuiqsut residents on an appropriate distance for cleared access areas as well as the depth of snowdrifts that impede travel under pipelines. As part of the Subsistence Plan (required in ROP H-1) and as part of the Proponent's notification and consultation with Alaska Native groups (ROP H-1), provide equal opportunities for various local entities (e.g., KSOP, NVN, City of Nuiqsut, Kuukpik), in addition to knowledgeable subsistence users, to provide input. Continue to consult with local subsistence users and community organizations regarding the appropriate design and location of subsistence boat ramps, pullouts, and subsistence tundra access ramps. Consult with other operators regarding other boat ramp projects on the North Slope that may inform future designs. Participate in Conflict Avoidance Agreements with the Alaska Eskimo Whaling Commission to reduce potential impacts on bowhead whale hunting resulting from barge and vessel traffic. Work with community organizations to establish measures to reduce impacts of vehicle traffic on subsistence activities, particularly during the Project's construction phase. Install traffic control signs (e.g., stop signs) to halt industry vehicle traffic at all subsistence access ramps to ensure that subsistence users can cross safely Place development-free buffer around Native Allotment of at least 1 mile to ensure the viability of the allotment for subsistence use. Exceptions would be made for allotment owners who agree to having development closer than 1 mile.
3.17 – Environmental Justice	Continue to use the KSOP to maintain meaningful engagement in the Project and identify continuing concerns and specific Project impacts. Attend government to government meetings between NVN and BLM, as requested by NVN or BLM, to discuss issues and resolution strategies through construction and operations.
3.18 – Public Health	Limited health data are available for Nuiqsut. The best data available date from the NSB's 2010 survey. Funding a collection of health information for Nuiqsut and studies of contaminant levels in local subsistence resources would provide better data for evaluation of potential health effects associated with oil field development and operation. Create a public health monitoring program at a regional level to track health indicators that are vulnerable to impacts from oil and gas activities. These indicators should focus on health outcomes and/or determinants of local concern that can be tied to oil and gas activity. Where possible, indicators should include threshold levels and specific actions should be developed for when thresholds are surpassed. The State should be responsible for the development and implementation of the monitoring program; however, the NSB and the Alaska Native Tribal Health Consortium should be consulted in the identification of appropriate indicators, thresholds, and responsive actions. Establish a Nuiqsut public health coordination group to conduct health education and engage the community in the public health monitoring program described above.
3.19 – Cumulative Effects	None
4.0 Spills	None

Note: ADNR (Alaska Department of Natural Resources); BLM (Bureau of Land Management); CPAI (ConocoPhillips Alaska, Inc.); HDD (horizontal directional drilling); KSOP (Kuukpik Subsistence Oversight Panel); MTI (module transfer island); NSB (North Slope Borough); ROP (required operating procedure); USACE (U.S. Army Corps of Engineers); VSM (vertical support member); WSE (water surface elevation).

4.0 COOPERATING AGENCY SUGGESTED MITIGATION MEASURES IN THE 2022 DRAFT SUPPLEMENTAL EIS*

During development of this Supplemental EIS' range of alternatives, BLM and cooperating agencies suggested additional mitigation measures during cooperating agency meetings and in correspondence that may reduce Project impacts. BLM developed potential mitigation measure comments made by cooperating agencies into potential mitigation measures by further developing the comment into an objective and a standard or requirement. Potential mitigation measures not enforceable by BLM were included if the measure could be imposed or mandated by another agency within their regulatory or permitting authority. Measures that were already included as part of Project LSs or ROPs, covered under other permit conditions (e.g., North Slope Borough rezoning), or would not be legal, were removed from further consideration.

The 2015 Greater Mooses Tooth 1 (GMT-1) ROD directed BLM to prepare a Regional Mitigation Strategy (RMS) to serve as a road map for mitigating impacts from GMT-1 and future oil and gas projects enabled or assisted by the existence of GMT-1 (such as the Willow MDP Project). The RMS identifies areas of potential impacts from oil and gas developments and provides examples of mitigation measures that may reduce those impacts. Additional suggested mitigation measures for the Willow MDP Project that were developed for the 2020 Final EIS and this Supplemental EIS are guided by the principles outlined in the RMS. The decision whether to adopt each new measure will be made in BLM's Willow MDP ROD.

Table I.4.1 presents the proposed cooperating agency mitigation measures under consideration in this Supplemental EIS.

Table I.4.1. Cooperating Agency Suggested Mitigation Measures*

No.	Objective	Standard/Requirement	Affected Resource(s)
1	Provide time between development projects to observe impacts and changes to baseline conditions. Observations from developed projects may result in additional NEPA review and analysis, changes to proposed projects (including phases), and/or new mitigation measures.	Proposed projects that would have a gravel footprint exceeding 300 acres would be limited to developing no more than 65% of the proposed project before instituting a minimum 2-year pause to observe project impacts (e.g., permafrost, hydrology, caribou, subsistence). The authorized officer will be responsible for determining the need for permit review based on the monitored findings.	All
2	Provide time before the construction of Project drill site BT5 is authorized to observe overall Project impacts and changes to environmental baseline conditions.	Drill site BT5 and the gravel roadway to BT5 will not be authorized for construction for three years after the construction of the Project's other three drill sites is complete.	All
3	Provide Nuiqsut with a guaranteed minimum proportion of the NPR-A impact mitigation fund as the Nuiqsut is the community most directly impacted by oil and gas development.	The NPR-A Impact Mitigation Fund will direct a minimum of 15% of the grant funding to the City of Nuiqsut. This direct funding would not prevent Nuiqsut from applying for grants from the NPR-A Impact Mitigation Fund.	Economics; Environmental justice
4	Provide additional resources to Nuiqsut to support search and rescue efforts. With expanded oil and gas development, many Nuiqsut residents travel further from the village to pursue subsistence opportunities. This expanded range strains the current search and rescue program in the community.	CPAI will provide Nuiqsut $250,000 for search and rescue equipment and operations with the start of Project construction (i.e., gravel placement). CPAI will provide a second $250,000 payment to Nuiqsut for additional search and rescue equipment following commissioning of the Willow processing facility.	Economics; Environmental justice; Public health
5	Reduce the amount of equipment traveling on Project roads at specific times to reduce impacts to caribou and subsistence users.	Install caribou monitoring stations that use real time caribou GPS telemetry data (i.e., caribou collars) and manage road use for successful caribou passage. The applicant and BLM will consult with the NSB wildlife department and ADF&G caribou experts to identify the minimum percentage of the Teshekpuk Caribou Herd that should have active GPS telemetry collars and the caribou density and distance from Project roads that will initiate traffic restrictions.	Caribou; Subsistence; Environmental justice
6	Reduce impacts to calving caribou (approximately May 20 through June 20).	Outdoor construction activity (e.g., gravel working, building fabrication) will be halted during caribou calving season when calving caribou are within 1 mile of the activity. Drilling and operations activity will be minimized at drill site pads during caribou calving season to the extent that is safely practicable; new activities (e.g., initiating drilling for a new well, hydraulic fracturing) will not be initiated at drill sites during this time.	Caribou; Subsistence; Environmental justice
7	Collect air quality monitoring data in the immediate area of development, between Nuiqsut and the Willow Project, to confirm the Project is operating at anticipated emissions levels (i.e., as modeled) and provide a record of regulatory emissions violations.	Install air quality monitoring stations at a predominantly down-wind location on a gravel pad used to directly support drilling or operations (e.g., drill site pad, processing facility pad). One air monitoring station will be required for every five drill site pads or single processing facility, per development project. This data will be collected and be made publicly available in real time through the North Slope Science Initiative website.	Air quality; Public health; Environmental justice

No.	Objective	Standard/Requirement	Affected Resource(s)
8	Limit overall activity or minimize air traffic at specific times to reduce impacts to caribou.	ROP F-1 requires the use of an Aircraft Use Plan. The plan will include the following: • Minimize Q400 traffic between Alpine and Willow during calving (May 20 to June 20) to reduce impacts to caribou. Q400 traffic between Willow and Kuparuk or Deadhorse is necessary and would be allowed. • Plans to minimize the disturbance to calving caribou (description of areas avoided, how flight numbers were minimized, and that low altitude flights were avoided or limited).	Noise; Caribou; Subsistence; Environmental justice; Wilderness characteristics
9	Maintain subsistence ramp access, including pullout surface area, free of obstructions, including equipment and material storage.	Materials and equipment shall not be staged on gravel road pullouts or in such a way as to block subsistence ramps or the roadway view for subsistence ramp users. Safe access to subsistence ramps will be maintained. Operators will incorporate staff training on the importance of maintaining clear and safe areas around pullouts and subsistence ramps into their orientation and safety programs. Operators will install signs at roadway pullouts stating, "Equipment and Materials Shall Not be Staged Here".	Subsistence; Environmental justice
10	Dispose all Project waste properly and in a timely manner.	Waste management plans shall specify the intervals for total site cleanup at areas of activity. Cleanup intervals will not exceed 72 hours during periods of activity, including on Project pads.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice
11	Further reduce impacts to nesting Yellow-billed loons from vehicle traffic.	In areas where roads cross through Yellow-billed loon nesting buffers, maximum vehicle speeds will be restricted to 25 mph within the buffer zone during the nesting season (approximately June 1 through July 31). These speed limits will be prominently signed during this period.	Birds
12	To minimize or avoid environmental harms caused by greenhouse gas emissions and ensure NEPA adequacy over the life of the Project. Analysis by the EPA indicates that with technological advances and new data provided by infield drilling following a development and production environmental impact statements, more petroleum hydrocarbons are often extracted from the target reservoir than originally estimated. This results in more greenhouse gas emissions produced than estimated or disclosed to the public.	A NEPA adequacy review will be completed if the barrels per day gross annual average is greater than 10% of the original barrels per day production target (disclosed in the development's most recent NEPA document) over a two-year period; or when the cumulative recovered reserves are greater than 10% of the original estimated recoverable reserves (disclosed in the development's most recent NEPA document).	Climate change
13	Protect surface waters in the Project area through monitoring and mitigation.	The Project will include an adaptive management plan "that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts" for monitoring and mitigation of potential surface water flow impacts throughout the Project area.	Water resources; Wetlands and vegetation; Fish
14	Protect and minimize impacts to surface waters at Ocean Point and across the Project area.	The Project will include an adaptive management plan for the Colville River crossing activity at Ocean Point.	Water resources; Fish

No.	Objective	Standard/Requirement	Affected Resource(s)
15	Minimize floodplain impacts where gravel roads, pads, or boat ramps may block or restrict the flow of surface waters during spring breakup through timely detection and corrective action.	The Project will prepare an adaptive management plan to address potential floodplain impacts where gravel roads, pads, or boat ramps may block or restrict the flow of water during spring breakup. The adaptive management plan will provide methods for detecting and correcting unanticipated blockages before they lead to further environmental degradation. The adaptive management plan will address the potential for spring breakup surface waters to: • Increase the depth and duration of water impoundment • Increase thermokarsting • Cause a change in flow direction • Cause channel instability or a change in alignment • Result in erosion of the tundra or a stream channel • Result in the deposition of sediment on the tundra or in a stream channel	Water resources; Wetlands and vegetation; Fish
16	Minimize impacts to the water levels of Willow Creek 3 and Lake M0015 resulting from the construction of the constructed freshwater reservoir.	CPAI will collect stage monitoring data for Willow Creek 3 and Lake M0015 during ice-free periods for three consecutive years prior to the start of construction of the constructed freshwater reservoir (under Alternatives B, C, and D). This information will be used to ensure adequate water levels are maintained during the filling and operations of the constructed freshwater reservoir.	Water resources; Wetlands and vegetation; Fish
17	Minimize the potential impacts of thawing and thermokarst from climate change on Project structures, including roads, pads, and the constructed freshwater reservoir to protect the TLSA.	CPAI will prepare an adaptive management plan that will be responsive to climate change by monitoring and mitigating potential thawing and thermokarst impacts on all Project structures including roads, pads, and the constructed freshwater reservoir.	Climate change; Permafrost; Water resources; Wetlands and vegetation
18	Collect health baseline data for a Community Health Study what will inform evaluation of potential health effects associated with oil and gas developments.	Fund the collection of baseline health information on Nuiqsut residents and a Community Health Study that studies contaminant levels in local subsistence resources. The study shall include a section on potential trends that may have occurred in local health during the Covid-19 activity slowdown in 2020.	Public health; Environmental justice
19	Reduce the concentration and/or intensity of flaring near Nuiqsut.	CPAI will prepare a coordination plan between the Kuparuk, Alpine, and Willow developments to minimize the use flaring across all three developments and to reduce the incidences of multiple facilities flaring simultaneously. When simultaneous flaring must occur, the length of flare overlap shall be minimized to the greatest extent possible.	Air quality; Climate change; Visual resources; Environmental justice; Public health; Wilderness characteristics
20	Improve local understanding and knowledge of traditional and scientific principles related to the oil and gas industry for school age children in Nuiqsut.	Fund traditional and western scientific education programs in Nuiqsut schools to help inform and improve the community's understanding of the oil and gas industry development and its associated impacts.	Environmental justice
21	Utilize local knowledge by including community members (e.g., elders, tribal council members, hunters, NSB wildlife experts) when conducting studies and Project planning.	Include local advisors (e.g., elders, tribal council members, hunters, NSB wildlife experts) as team members when conducting studies, identifying historic sites, and completing Project planning.	Fish; Birds; Terrestrial Mammals; Marine Mammals; Subsistence; Environmental justice; Cultural resources

No.	Objective	Standard/Requirement	Affected Resource(s)
22	Provide the community with information on the health of local subsistence resources.	Fund an NSB wildlife biologist position stationed in Nuiqsut to help the community and NSB monitor wildlife health and provide the community information on the safety of consuming subsistence resources.	Subsistence; Environmental justice; Public health
23	Improve the design and deployment of subsistence access ramps so they are safe and effective for community members.	Develop an adaptive management plan for subsistence access ramps that considers community input for improvements to subsistence ramp design and to address modifications of existing subsistence ramps. New subsistence ramps will be placed at a minimum of 1 ramp for every 3 miles of new gravel road. CPAI will meet with the community of Nuiqsut to establish subsistence ramp design parameters to ensure the designs are adequate for users. Design parameters will include a minimum length "landing ramp" at the top that is level and long enough to accommodate snow machines pulling sleds without sleds having to enter the associated pullout or adjacent road. The design parameters will set a maximum grade of the ramps. The subsistence ramp pullouts will be signed that materials and equipment are not to be stored at pullouts. Warning signs will be placed on the adjacent roadway approaching the subsistence ramp/pullout to warn drivers of the potential for vehicles (e.g., snowmachines, all-terrain vehicles) crossing the road. Subsistence ramp locations will be made available to local search and rescue groups (e.g., Nuiqsut, NSB) as GPS coordinates and on published maps.	Subsistence; Environmental justice; Public health
24	Support the local community's needs for gravel infrastructure maintenance.	Provide Nuiqsut gravel to support road maintenance, specifically the subsistence access road.	Environmental justice
25	Collect additional air pollutant data in Nuiqsut and make the data available to the public.	Expand the air monitoring capabilities in Nuiqsut to include monitoring for hazardous air pollutants, volatile organic compounds, and polycyclic aromatic hydrocarbons. The measured concentrations will be made available in near real time for the community and the public at large.	Air quality; Fish; Birds; Terrestrial mammals; Marine mammals; Public health; Environmental justice
26	Reduce caribou deflection.	Aboveground pipelines shall have a nonreflective finish.	Visual resources; Terrestrial mammals; Subsistence; Environmental justice; Wilderness characteristics
27	Test local subsistence resources for contamination.	Provide periodic testing of consumable subsistence resources for contamination. Testing frequency and the number of samples tested per testing interval will be determined in consultation with the community of Nuiqsut.	Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice; Public health

No.	Objective	Standard/Requirement	Affected Resource(s)
28	Provide independent oversight and management to the air quality monitoring station in Nuiqsut.	CPAI shall fund the Nuiqsut air quality monitoring station. A third-party contractor will be identified to operate and maintain the station. The third-party contractor will develop a training program open to Nuiqsut residents for operating and maintaining the monitoring station, with appropriate technical oversight completed by the contractor.	Air quality; Public health; Environmental justice
29	Provide local subsistence oversight of all field activity being conducted in support of the Project.	A subsistence representative shall be present whenever field activity is occurring, including having representatives scheduled to cover day and night work shifts. Subsistence representatives are to be included in all field activities conducted in support of the Project.	Subsistence; Environmental justice
30	Actively monitor for pollution indicators in the environment for the duration of the Project and modify Project activities as needed to address found contamination.	Develop an ongoing contamination study program (e.g., snow sampling, fish sampling) and adaptive management plan to address found contamination. Any contamination found in excess of State or EPA levels will be reported to ADEC within 72 hours of being determined.	Air quality; Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice; Public health
31	Monitor for and minimize impacts from hydraulic fracturing or underground injection control disposal well operation.	Monitor water quality, permafrost, and vegetation near sites where hydraulic fracturing or deep well injection (i.e., underground injection control wells) are occurring for potential contamination or unanticipated impacts. Develop an adaptive management plan that outlines how impacts would be analyzed and potentially addressed.	Air quality; Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice; Public health
32	Protect vegetation along ice road routes.	Monitor vegetation along ice road footprints for vegetation damage and compression of soil and vegetation. Because ADNR monitors only tussock tundra and soil compaction, this measure focuses on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss). Additionally, the percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes.	Wetlands and vegetation
33	Provide the Nuiqsut community with a level of control and oversight on baseline studies to Nuiqsut.	The community of Nuiqsut shall be involved in the development of studies in the Project area, from study design to implementation. CPAI shall present planned studies (e.g., study requirements, methodology, timing) to the community and incorporate feedback as practicable. CPAI will provide regular updates to the community about ongoing studies and study planning.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice
34	New bridges will not interfere with subsistence activity.	CPAI shall consult with Nuiqsut on the design of proposed Project bridges to ensure they provide adequate clearances and safe passage for boaters traveling along waterways.	Subsistence; Environmental justice

No.	Objective	Standard/Requirement	Affected Resource(s)
35	Protect oilfield workers from retaliation for reporting on-the-job issues.	CPAI shall include topics on how to report violations to company policy, regulatory requirements, or state and local laws and whistleblower protections for CPAI employees or their contractors who report such violations.	Economics; Environmental justice
36	Provide adequate agency (State of Alaska and the NSB) oversight of Project construction and operations to ensure permit compliance.	BLM shall coordinate with the State of Alaska and the NSB to provide an adequate number of inspectors on site during construction and operations of the Project to ensure the project is in compliance with its permits. CPAI shall provide site access and accommodations to the required inspection staff.	All
37	Identify important inter-community subsistence areas.	CPAI shall conduct at least two multi-village workshops during project development to identify important inter-community subsistence areas. The communities included for the Project are at a minimum: Nuiqsut, Utqiaġvik, Anaktuvuk Pass, and Atqasuk.	Subsistence
38	Determine potential impacts mine site blasting has on fish returns and caribou migration.	Develop and conduct a study to monitor for and determine potential impacts that may occur to fish returns and caribou migration from mine site blasting.	Fish; Terrestrial mammals; Subsistence; Environmental justice
39	Determine if contaminants potentially migrate off the drill site BT2 North pad.	Institute a monitoring program for drill site BT2 to determine if contamination migrates off the gravel pad. Monitoring shall include water, snow, soil, and vegetation sampling. Any contamination found in excess of State or EPA levels will be reported to ADEC within 72 hours of being determined.	Water resources; Wetlands and vegetation; Fish; Birds; Terrestrial mammals; Marine mammals; Subsistence; Public health
40	Nuiqsut residents must rely on imported foods to a greater extent when subsistence resources are negatively impacted by oil and gas development. Protect imported food supplies during transit through Utqiaġvik and Deadhorse to Nuiqsut.	Imported foods are frequently stored improperly and are damaged or ruined prior to arrival in Nuiqsut. CPAI shall pay to construct food storage facilities at airports in Deadhorse and Utqiaġvik to protect perishable goods from precipitation, freezing, spoiling, and wildlife.	Subsistence; Environmental justice; Public health
41	Provide laboratory testing in Nuiqsut for standard testing protocols to avoid having to send samples for testing to Utqiaġvik, Fairbanks, or Anchorage.	Construct and operate an environmental testing laboratory in Nuiqsut.	Economics; Environmental justice, Public health
42	Minimize the deflection and disruption of caribou migratory patterns.	Restrict noise (e.g., limit drilling, limit construction activity) when caribou are present during the calving and migration periods. When noise is unavoidable, avoid abrupt sounds. A steady drone of noise is easier for caribou to acclimate to, so consider adding a white noise generator if necessary to lessen abrupt sounds.	Terrestrial mammals; Subsistence
43	Minimize the deflection and disruption of caribou migratory patterns.	Limit the overall activity, including outdoor foot traffic, and minimize air traffic at specific times to reduce impacts to caribou (especially during calving and migration periods).	Terrestrial mammals; Subsistence
44	Minimize the deflection and disruption of caribou migratory patterns.	Minimize visual impacts by fencing or otherwise camouflaging or screening pads and areas that have the most activity and movement. Caribou are more likely to turn away from movement than from structures perceived as stationary objects. Caribou also react more strongly and habituate less readily to foot traffic than to vehicle traffic.	Visual resources; Terrestrial mammals; Subsistence; Wilderness characteristics

No.	Objective	Standard/Requirement	Affected Resource(s)
45	Minimize the deflection and disruption of caribou migratory patterns.	Protect hunting success versus biological success by: • Reducing the number of animals required to halt traffic ("let the lead caribou cross"). • Limiting traffic during the fall hunting period (approximately September 15 through October 15) and incorporate local recommendations for the timeframe. • Following the Red Dog Mine model for caribou crossings. • Use recommendations from the subsistence committee. • Stopping traffic as soon as caribou are sighted or when caribou are a half mile or less from the road. • Incorporate crossing ramps, 7-foot tunnels/overpasses, and/or visual windows into road design when possible.	Terrestrial mammals; Subsistence
46	Minimize the deflection and disruption of caribou migratory patterns.	Buffer the Teshekpuk Caribou Habitat area by 5 to 6 kilometers (3.1 to 3.7 miles) to account for the avoidance response of calving caribou to infrastructure.	Terrestrial mammals; Subsistence
47	Minimize deflection and disruption of caribou migratory patterns.	Use convoys and/or checkpoints to moderate traffic flow and to consolidate traffic in space and time.	Terrestrial mammals; Subsistence
48	Minimize the deflection and disruption of caribou migratory patterns through monitoring and awareness.	Employ caribou monitoring personnel to maintain awareness of presence and movements of caribou.	Terrestrial mammals; Subsistence
49	Minimize the deflection and disruption of caribou migratory patterns through suspension of off-pad activities at critical times.	Off-pad activities shall be suspended from May 20 through June 20, unless approved by the authorized officer. The intent of this requirement is to restrict activities that would disturb caribou during calving. The permittee shall submit a stop-work plan that considers this, and other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur over the life of the Project (approximately 30 years).	Terrestrial mammals; Subsistence
50	Minimize the deflection and disruption of caribou migratory patterns through ground traffic restrictions on permanent oil and gas-related roads.	The following ground traffic restrictions shall apply to permanent oil and gas-related roads: • From May 20 through August 20, traffic speed shall not exceed 15 mph when caribou are within 0.5 mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, stockpiling equipment and materials, etc. to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and other mitigation measures. • The permittee shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic would be stopped: o Temporarily to allow a crossing by 10 or more caribou. The permittee shall submit with the development proposal a vehicle use plan that considers these and other mitigation measures. o By direction of the authorized officer, traffic may be stopped through the Project area for a limited amount of time, and only if necessary to prevent displacement of calving caribou. Such closures will not be undertaken without first consulting with permittees to assess operational impacts on permitted activities.	Terrestrial mammals; Subsistence

No.	Objective	Standard/Requirement	Affected Resource(s)
51	Minimize the deflection and disruption of caribou migratory patterns through air traffic restrictions.	ROP F-1 requires the use of an Aircraft Use Plan. The plan will include the following: • Minimize Q400 traffic between Alpine and Willow during calving (May 20 to June 20) to reduce impacts to caribou. Q400 traffic between Willow and Kuparuk or Deadhorse is necessary and would be allowed. • Plans to minimize the disturbance to calving caribou (e.g., description of areas avoided, how flight numbers were minimized, and that low altitude flights were avoided or limited).	Noise; Terrestrial mammals; Subsistence; Wilderness characteristics
52	Reduce the impacts to subsistence users resulting from increased travel requirements for subsistence users.	Provide household level vouchers for fuel (not fixed dollar value) to support subsistence activities on a quarter-annual basis.	Subsistence; Environmental justice
53	Provide a funding source to support Nuiqsut healthcare needs.	Provide funding to support the Nuiqsut healthcare clinic so that treatment options available in the clinic can address the most frequent concerns (e.g., asthma).	Environmental justice; Public health
54	Provide a funding source for a professional third-party contractor to design and administer a human health study.	Provide funding to the City of Nuiqsut to contract with a third-party professional organization or consultant to develop and administer a human health study. The study shall consider unique aspects to life on the North Slope, including the consumption of subsistence food sources.	Environmental justice; Public health
55	Provide BLM with ready access to CPAI's North Slope roads (e.g., Kuparuk, Alpine, Greater Mooses Tooth, Willow).	Develop a road use agreement between CPAI and BLM that provides BLM unfettered access of project gravel and ice roads, except when safety may be jeopardized by road conditions or activity.	All
56	Continue the long-term caribou monitoring project in and near Nuiqsut through the life of the Willow Project to provide better understanding of the effects of North Slope oil and gas development on caribou.	Continue to fund the long-term caribou monitoring project in and near Nuiqsut through the life of the Willow Project.	Terrestrial mammals; Subsistence; Environmental justice
57	Provide funding for a caribou collaring study within the Willow Project area.	Provide a funding mechanism to support ongoing caribou collar studies through construction of the Willow Project and five years of operations only activity to provide a better understanding of caribou responses to increased oil and gas development.	Terrestrial mammals; Subsistence
58	Support the development of a cultural center in Nuiqsut.	Provide funding to help design and develop a cultural center in Nuiqsut for the community's use.	Sociocultural systems; Environmental justice
59	Provide funding for a caribou movement study in the Alpine and Greater Mooses Tooth project areas.	Provide a funding mechanism to support ongoing Teshekpuk Caribou Herd studies in the Alpine and Greater Mooses Tooth project areas with a focus on how caribou respond to roads and vehicle traffic.	Terrestrial mammals; Subsistence; Environmental justice
60	Prevent collisions by birds with overhead power lines and guy wires during mating, inclement weather (e.g., fog), and migration	Add to ROP E-15: Communication towers should be monopoles without guy wires that could be a collision hazard for birds.	Birds
61	Use white strobe lights instead of solid, or pulsating (beacon) red lights to reduce attracting night-migrating birds to tower structures exceeding 200 feet in height with required FAA lighting	Add to ROP E-8: For tower structures exceeding 200 feet in height with FAA required lighting, use white (preferable) or red strobe lights. The strobes should be set at the minimum number of flashes per minute allowable by the FAA. The use of solid red or pulsating red warning lights at night should be avoided, if possible.	Birds

No.	Objective	Standard/Requirement	Affected Resource(s)
62	Protect birds during nesting season	Construction/placement of gravel for roads and pads should occur in winter to avoid damage to nesting birds, eggs, and hatchlings and adjacent tundra habitats. No gravel placement or tundra disturbance should occur during bird nesting season (June 1 to July 31). For airstrip construction, snow removal and the first layer of gravel for the entire airstrip footprint should take place in late May, prior to the onset of the bird nesting season. Additional gravel layers within the footprint can then be placed and compacted throughout the summer without damage to birds and habitats.	Birds
63	Prevent ponding of sheet flow and maintain natural flow during rain events	Place culverts within long linear roads in sufficient number to prevent ponding of sheet-flow and to maintain natural flow throughout break-up and summer/fall rain events.	Water resources
64	Prevent high-water erosion of roads/pads and stream bottoms	Place erosion control material (e.g., supersacks, revetment) on banks of rivers under and adjacent to bridges and adjacent to and on bottom of stream approach and exit of large culvers (when necessary) to prevent high-water erosion of road or pad and stream bottom.	Water resources
65	Protect surface waters	Prohibit the discharge of any contact fluids into surface waters.	Water resources
66	Implementation of an Adaptive Management Plan	Implement an adaptive management plan that includes regular monitoring and is responsive to floodplain impacts, thermokarst development, changes in hydrology, vegetation damage, seasonal flows, water levels, erosion, deposition throughout the Project area.	Soils
67	Improve and protect food security by providing alternative methods for fresh food production.	Provide gravel and building materials for construction of a public greenhouse suitable for Arctic conditions, to protect food security and allow communities to better adapt to the future climate through the establishment of local fresh food production.	Public health; Environmental justice

Note: ADEC (Alaska Department of Environmental Conservation); ADF&G (Alaska Department of Fish and Game); ADNR (Alaska Department of Natural Resources); BLM (Bureau of Land Management); BT2 North (drill site BT2 North); BT5 (drill site BT5); CPAI (ConocoPhillips Alaska, Inc.); EPA (U.S. Environmental Protection Agency); FAA (Federal Aviation Administration); GMT-2 (Greater Mooses Tooth 2); GPS (global positioning system); mph (miles per hour); NEPA (National Environmental Policy Act); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); ROP (required operating procedure); TLSA (Teshekpuk Lake Special Area).

5.0 SUGGESTED MITIGATION MEASURES FROM PUBLIC COMMENTS ON THE DRAFT SUPPLEMENTAL EIS

During public comment period on the Draft Supplemental EIS, BLM received suggested additional mitigation measures that may reduce Project impacts. Table I.5.1 presents the proposed mitigation measures suggested by the cooperating agencies, stakeholders, and the public that are considered in this Supplemental Final EIS.

Table I.5.1. Public Comment Period Suggested Mitigation Measures*

No.	Objective	Standard/Requirement	Affected Resource(s)
1	Implement an adaptive management plan to address surface water blockages,	Implement an adaptive management plan that addresses surface water blockages around Project infrastructure.	Water resources
2	Monitor for permafrost thaw and implement an adaptive management plan to address identified permafrost thaw and thermokarsting.	Implement an adaptive management plan that addresses monitoring potential permafrost thawing and thermokarst impacts for all Project structures, including roads, pads, and the constructed freshwater reservoir (under Alternatives B, C, and D) to further protect the TLSA. Share monitoring information with ADF&G and other relevant agencies.	Climate change; Soils and permafrost

No.	Objective	Standard/Requirement	Affected Resource(s)
3	Limit the disturbance of tundra-nesting birds.	Limit road upgrades to times outside of the bird nesting season (generally July 1 through July 31).	Birds
4	Provide access to gravel resources for local community infrastructure projects.	Permittee shall stockpile excess gravel from open cells at the Tinmiaqsiugvik mine site for use in community infrastructure projects. The permittee would operate the mine site on behalf of the community, and the community shall be responsible for obtaining a mineral materials sales contract from BLM.	Environmental justice
5	Improve access for subsistence users and reduce the need for snow road construction.	Provide the State of Alaska's Community Winter Access Trail access to Willow gravel and ice road infrastructure for use to reduce the reliance on constructing snow roads through the Willow Project area.	Subsistence; Air quality; Climate change; Environmental justice
6	Reduce helicopter and fixed-wing aircraft flight impacts to wildlife and subsistence users.	Use unmanned aerial vehicles (i.e., drones) to conduct inspections and surveys to the greatest extent practicable to reduce impacts to wildlife and subsistence users.	Noise; Birds; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice; Wilderness characteristics
7	Prevent spread of invasive species in the Project area.	Use existing and temporary indoor and outdoor vehicle washing facilities and inspection stations in locations as needed to wash and inspect vehicles prior to use in the Project area. Permittee will follow an Invasive Species Monitoring Control Plan for vehicle washing practices and to monitor for invasive species.	Wetlands and vegetation
8	Reduce downstream greenhouse gas emissions resulting from the Willow Project.	The Willow project would cease producing oil 20 years from the date of the spudding of the first well.	Climate change
9	Reduce net greenhouse gas emissions resulting from the Willow Project.	Permittee shall offset 50% of the projected net GHG emissions associated with the final preferred alternative selected in the Project's Record of Decision, in accordance with U.S. commitments under the Paris Agreement, and calculated as follows. GHGs shall be offset through reforestation of land (as opposed to preservation of existing forest land), and the required acreage of reforestation necessary to offset the Project's GHG's shall be calculated by assuming that the average mature tree can sequester (i.e., consume and retain) up to 48 pounds of carbon dioxide per year (European Environment Agency 2011). In its 2022 budget justification, the U.S. Forest Service reported that the National Forest System's reforestation needs are estimated at 4 million acres (USFS 2021). These efforts are accomplished with the help of non-profit partners such as the National Forest Foundation and civic groups who contribute to the agency's capacity for reforestation through partnerships and matching fund agreements. Implementation of this mitigation measure would require the permittee to offset 50% of the projected net GHG emissions associated with the Project (approximately 69 to 73 million metric tons of net CO_2e compared to Alternative A, depending on the action alternative and choice of global warming potential). The U.S. has established an economy-wide target of reducing its net GHG emissions by 50% to 52% below 2005 levels in 2030 in its NDC under the Paris Agreement (UNFCCC 2021); offsetting 50% of the net Willow emissions over the life of the Project would help the U.S. achieve this goal.	Climate change

No.	Objective	Standard/Requirement	Affected Resource(s)
10	Increase food security by providing adaptive measures for food storage	Permittee shall work with the local community to improve food storage capacity and durability. This could include providing gravel and insulation to "harden" existing cellars, providing transportation of chest freezers to the North Slope, etc.	Climate change; Subsistence; Environmental justice; Public health
11	Facilitate clean-up of historic contamination.	Permittee shall work with the BLM to facilitate access to contaminated sites using temporary and permanent Willow Project infrastructure to promote clean-up efforts.	Hazardous materials; Environmental justice; Public health
12	Minimize impacts to soils and vegetation from snow and ice infrastructure.	Permittee would provide BLM with as-built GIS of snow and ice infrastructure at the end of every winter season. Ice road and pad alignments shall be different every year to minimize impacts to soils and vegetation unless otherwise approved by the BLM authorized officer. Snow roads may use the same alignment year to year depending on snow conditions.	Soil; Wetlands and vegetation
13	Provide North Slope residents access to Colville River ice road crossings.	Permittee shall allow reasonable access to North Slope residents to use ice roads built for the Willow Project, including the annual Colville River ice bridge.	Subsistence; Environmental justice
14	Reduce methane emissions from project activities.	Permittee shall use the best available technology to reduce venting of methane to the atmosphere during wellhead and processing facility maintenance. Remote inspections of pipelines and well-pads will occur once per quarter to inspect for methane leaks.	Air quality; Climate change; Public health
15	Monitor water quality for contamination.	Develop a water quality monitoring plan to regularly sample area waterways for contamination downstream from Project facilities.	Water quality; Fish; Subsistence; Public health
16	Provided targeted employment opportunities for NSB residents, particularly Nuiqsut residents.	Provide job training, hiring events, and outreach to local residents in the NSB. These employment outreach efforts will include training for upcoming Project positions, as well as engagement with locally owned support service companies to provide an overview of the types of Project support that will be required. Employment outreach in Nuiqsut will be held at least once per year.	Economics; Environmental justice
17	Protect stream banks, minimize compaction of soils, and minimize breakage, abrasion, compaction, and displacement of vegetation resulting from winter tundra travel.	a. Off-road travel will be allowed by the BLM authorized officer when soils are frozen to sufficient depth (defined by a soil temperature of 23 degrees Fahrenheit or lower at a depth of 12 inches), and 6 inches of snow cover exists. Snow distribution and pre-packing may be used to maintain sufficient snow cover in areas of poor snow coverage. The permittee shall submit data to BLM to show that these conditions have been reached prior to conducting work. Snow survey and soil freeze-down data collected for ice road or snow trail planning and monitoring shall be submitted to BLM with the required weekly report of operations. b. Off-road travel is generally to be conducted with low-ground-pressure vehicles unless otherwise approved by the BLM authorized officer. Low-ground pressure is defined as vehicles with less than 4 pounds per square inch ground pressure, or vehicles that have passed the Alaska Department of Natural Resources low-pressure vehicle qualification certification. c. Ice roads would be designed and located to avoid the most sensitive and easily damaged tundra types, as much as practicable. d. The permittee shall provide the BLM with an as-built of all ice roads, snow trails, and ice pads after the infrastructure is completed. Data must be in a GIS format (Esri shapefiles referencing the North American Datum of 1983).	Wetlands and vegetation; Birds; Terrestrial mammals; Subsistence
18	Minimize impacts to denning polar bears.	Permittee will conduct two airborne infrared surveys for polar bear dens prior to initiating winter activities.	Marine mammals

No.	Objective	Standard/Requirement	Affected Resource(s)
19	Minimize impacts to streams from Project boat ramps.	Develop a maintenance plan for boat ramps to ensure the long-term viability and use of the site(s) while minimizing impacts to the adjacent waterbodies. The initial plan shall be submitted to the BLM authorized officer 60 days prior to initiating the first year's maintenance activities. Any substantive changes to the maintenance plan will be submitted to BLM prior to initiation of maintenance activities impacted by those changes. The plan will include such measure as: a. Determine if erosion mitigation features or options in engineering design of boat ramp(s) are needed to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks. Describe the evaluation that was completed to determine if erosion control is needed and what type of features are included in the final design. b. Identify entity responsible for site maintenance. c. Describe annual maintenance (grading) of parking pads, turning pads, access ramps, and road access. d. Identify the gravel source for reinforcement of boat ramps and pads when necessary. Describe the location and quantity of gravel available and the frequency of how often the need for additional gravel will be evaluated. e. Include regular clean-up of pads and surroundings, including back-haul of trash to suitable disposal site. f. Describe how spills will be removed or mediated per the Project's spill plan.	Water resources; Fish; Marine mammals; Subsistence
20	Provide economic development opportunities in the community of Nuiqsut.	Permittee shall materially support economic development workshops focused on identifying and developing small business ideas that are not dependent on the extraction industry. Workshops will provide information about how to apply for small business grants, how to craft a business plan, etc.	Economics; Environmental justice
21	Reduce impacts from blasting at the Willow Tiŋmiaqsiuġvik mine site.	CPAI will evaluate the use of a surface miner at the Tiŋmiaqsiuġvik mine site to develop the gravel resource. CPAI will use a surface miner at the Kuparuk Mine Site during the initial winter construction season and shall provide a report to BLM on the efficacy of this equipment in North Slope conditions no later than June following the initial construction season. The report shall describe how the equipment was used, any engineering or logistical challenges of using this equipment, and steps taken to adapt the surface miner for use in North Slope operations. If the surface miner is determined to be technologically feasible as an alternative to blasting, BLM will require its use at the Willow Tiŋmiaqsiuġvik mine site to reduce the impacts of blasting. (Note: some blasting would still be required to remove overburden).	Noise; Terrestrial mammals; Marine mammals; Subsistence; Environmental justice; Wilderness characteristics
22	Permanently protect the most important habitat areas for the maternal and migrating caribou of the Teshekpuk Caribou Herd, including Teshekpuk Lake, a buffer around the lake, and the migration corridors to the east and northwest.	BLM will develop compensatory mitigation that provides durable, long-term protection for the Teshekpuk Caribou Herd to fully offset impacts of the Project on that Herd, to include protecting the surface area of Teshekpuk Lake, a buffer along all shores of the lake, and the LS K-10 Caribou Movement Corridors/K-16 Deferral Areas (under Alternative E in the 2020 National Petroleum Reserve in Alaska Integrated Activity Plan Final Environmental Impact Statement) using existing statutory, management, or administrative authorities, with a focus on restricting future leasing or surface development in those areas.	Visual resources; Water resources; Wetlands and vegetation; Birds; Terrestrial mammals; Marine Mammals; Land ownership and use; Subsistence; Environmental justice; Wilderness characteristics

Note: ADF&G (Alaska Department of Fish and Game); BLM (Bureau of Land Management); GHG (greenhouse gasses); GIS (geographic information system); NSB (North Slope Borough); TLSA (Teshekpuk Lake Special Area).

6.0 NORTH SLOPE BOROUGH REZONING REQUIRED MITIGATION MEASURES*

As part of the North Slope Borough's process to rezone the Willow Project area from Conservation District to Resource District land use designations, the Project received additional review from the NSB. The NSB's rezoning approval included both required stipulations and mitigation measures and conditions of approval. These NSB requirements are intended to further mitigate impacts to wildlife, subsistence use, and public health and safety from the Project.

Table I.6.1. summarizes the NSB rezoning required stipulations and mitigation measures and Table I.6.2 summarizes the NSB rezoning conditions of approval.

Table I.6.1. North Slope Borough Rezoning Required Stipulations and Mitigation Measures*

No.	Category	Stipulation or Mitigation Measure
1	Overall/General – Duck Ponds	CPAI and its contractors shall place or affix permanent ownership identification and unique numbering on every duck pond owned and used.
2	Overall/General – Mitigation Fund	CPAI shall mitigate the impacts on local residents related to the additional infrastructure in the area and the potential for reduction of subsistence resource availability, including the impacts related to displacing resources from high priority subsistence use areas. Commencing with the start of construction and continuing for the life the project, in addition to any other agreements CPAI shall make annual payments in the amount of $50,000 per year to a mitigation fund directed and administered by the NSB.
3	Subsistence – Access	CPAI shall consult with the NSB, NVN, Kuukpik, and KSOP at least annually. Examples of uses and developments requiring consultation include but are not limited to the following: (1) construction of facilities and roads; (2) aircraft movement; (3) drilling; and (4) the selection of water sources. Through this consultation, CPAI shall make reasonable efforts to assure that planned activities are compatible with subsistence activities and will not result in unreasonable interference with subsistence harvests or subsistence resources. CPAI shall submit a report of this consultation, including areas of agreement and identification of any unresolved conflicts, to the Administrator prior to the commencement of the uses/developments at issue. The Administrator may take measures consistent with NSB municipal code Title 19 to address any unresolved conflicts relating to said uses/developments.
4	Subsistence – Due Diligence	CPAI shall exercise due diligence to mitigate all adverse impacts on subsistence use activities caused by CPAI's activities.
5	Subsistence – Timing	To the maximum extent practical, initial project construction activities, such as construction of gravel roads, pad, pipeline and bridges, will be done during the winter season.
6	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	Study designs will be discussed and coordinated with the NSB DWM for submittal to the NSB by March 1, 2021, and each year thereafter as necessary. The NSB DWM and Planning will review, seek revisions as appropriate, and approve the study designs by April 1, 2021, and each year thereafter as necessary.
7	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	An annual report will be prepared and distributed to NSB DWM and Planning departments by February 15 and a meeting scheduled with NSB DWM and Planning, to occur by April 1. This meeting will discuss the results and the potential need for adjustments to scope to assess possible impacts to caribou, waterbirds, fish, and subsistence users. The Land Management Administrator and Director of the DWM will make the final decision of whether study designs need to be altered and/or additional data collection or analyses are required.
8	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will consult with KSOP on study design prior to submittal to the NSB and provide KSOP with annual reports.
9	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will make data available from their studies annually to the NSB DWM and within a year of completion of the study to the general public through a data archive (e.g., University of Alaska's Geographical Information Network of Alaska, Alaska Ocean Observing System).
10	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	CPAI will provide the DWM with reports from studies (e.g., wildlife, habitat, erosion) required by other agencies involved in permitting lands associated with the Willow Project, and to the maximum extent practical where multiple study requirements can be aligned, avoid duplication of study efforts among the NSB and such other agencies.

No.	Category	Stipulation or Mitigation Measure
11	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	To the extent practicable, CPAI and its contractors will minimize flights by hiring local boat drivers, snow machine drivers, and allowing their contractors to camp at a study site.
12	Wildlife and Habitat Protection – General Provisions for Studies on Wildlife and Subsistence	To the extent practicable, CPAI will involve students from Nuiqsut (or other North Slope communities if no students are available from Nuiqsut) in their studies.
13	Wildlife and Habitat Protection – Caribou	CPAI will fund a caribou study to analyze the distribution and movements of caribou around the Willow Project area and adjacent areas to assess habitat relationships and possible impacts from development. CPAI will fund a third-party contractor to: • Characterize pre-construction caribou movements utilizing historic telemetry data • Assist ADF&G or the NSB DWM in the collection of GPS telemetry data (e.g., potential purchase of additional caribou collars or database management) • Determine caribou pre- and post-construction movement rates in relation to roads pipelines and pads associated with their project • Characterize habitat conditions (e.g., snow melt, vegetation habitat, plant biomass, infrastructure) within the study area using best available technology • Evaluate these indices of habitat conditions, with particular attention to possible impacts from development, on the distribution of caribou utilizing the study area
14	Wildlife and Habitat Protection – Birds	CPAI will conduct a study of molting waterfowl in the vicinity of the Willow Project and farther to the west. The final study area will be determined in consultation with the DWM and after consulting with the USFWS to determine the area that is currently being monitored for molting geese. The study will be conducted for at least three years. After that time, the results will be reviewed and a determination will be made about whether the surveys need to continue and if so, for how long. The final determination will be made by the Land Management Administrator and Director of the DWM.
15	Wildlife and Habitat Protection – Birds	CPAI will fund a third-party contractor to conduct a breeding shorebird study in and adjacent to the Willow Project area. As this is known to be important shorebird breeding habitat, baseline studies will be conducted annually pre-development, and at least once every three years after development has been initiated. This study will document shorebird abundance, density, and nesting success.
16	Wildlife and Habitat Protection – Birds	CPAI will fund a third-party contractor to conduct a Yellow-billed loon study in and adjacent to the Willow Project area. To minimize impacts to breeding Yellow-billed loons, the study will document presence and habitat use (breeding/non-breeding) through techniques such as aerial or ground surveys but will avoid nest examination until termination of nesting.
17	Wildlife and Habitat Protection – Fish	CPAI will fund a third-party contractor to collect baseline data to help detect possible impacts, mitigate impacts, or conduct a damage assessment in the event of oil spills and/or release of oil-related products. Potential impacts are not restricted to population level effects.
18	Wildlife and Habitat Protection – Fish	CPAI will repeat required predevelopment studies (baseline) outlined by BLM and USFWS every four years. Should differences be detected from baseline, then CPAI will consult with NSB DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for the Willow Project, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.
19	Wildlife and Habitat Protection – Fish	CPAI will experimentally determine the effect of sublethal hydrocarbon exposure and persistence of detection of exposure on two species of fish (fourhorn sculpin and Arctic Cisco) and two prey items of fish, at four temperatures that reflect local seasonal changes (summer, autumn, and spring and winter) using, Alaska North Slope Crude oil and, when available, hydrocarbon from the Willow Project (i.e., not mixed to produce Alaska North Slope Crude). This experimental method must be developed so that it can used to determine whether fish and their prey items have been exposed during accidental releases of hydrocarbons from CPAI operations. If no accidental releases occur in 10 years, then repeat the experiment using more updated tools, methodologies, and analyses, while making sure that previous experimental results can be used for comparison. If data are not sufficient to fulfill this stipulation, additional studies may be required.

No.	Category	Stipulation or Mitigation Measure
20	Wildlife and Habitat Protection – Fish	Fish detected with water mold or other newly emerging infections in both the Nuiqsut Fall Fishery and in areas associated with CPAI's influence will be recorded, collected, and reported to the NSB DWM.
21	Wildlife and Habitat Protection – Water Quality	CPAI will collect data on water quality and hydrology to help detect potential Project related impacts on fish and the subsistence fishery. CPAI will be required to repeat required predevelopment studies (baseline) outlined by BLM and USFWS every four years. Should differences be detected from baseline, then CPAI will consult with NSB DWM on whether additional studies are required to explain differences and/or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for the Willow Project, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.
22	Wildlife and Habitat Protection – Subsistence	CPAI will fund a contractor to design and conduct a subsistence study that investigates the effects of CPAI's Willow Project development activities and associated infrastructure, as well as future exploration and development activities and associated infrastructure, to subsistence hunters from Nuiqsut. The study should focus on all of CPAI's facilities and activities within the area that is subject to this re-zone, as well as facilities and activities outside of this area that have the potential to impact subsistence resources and activities within the area, as determined by discussions with the NSB DWM and Planning staff. The project should at a minimum: • Examine possible effects from CPAI developments and activities to subsistence activities, especially on caribou and migratory bird hunting • Document hunter concerns and opinions about impacts from CPAI's facilities and activities associated with this rezone
23	Minimizing Traffic Impacts – General	CPAI shall coordinate with KSOP, Kuukpik, and the NSB DWM and Planning departments to establish standard air traffic routes that will minimize interference with animal concentrations. (Concentrations of caribou herds are of particular concern.) CPAI shall follow these routes unless there is a threat to human safety, or an animal concentration or subsistence user is positioned along the routes.
24	Onshore Oil and Gas Pipelines and Roads – General	Siting, design, construction, and maintenance of pipelines must minimize alteration of shorelines, water courses, wetlands, and tidal marshes and avoid significant disturbance to important habitats and critical migration periods.
25	Onshore Oil and Gas Pipelines and Roads – Consolidation	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, must be consolidated to the maximum extent possible.
26	Onshore Oil and Gas Pipelines and Roads – Wildlife Crossing	Pipeline design and construction shall be based on the best available information and include adequate pipeline elevation, ramping, or burial to provide for unimpeded wildlife crossing. Aboveground pipelines and all associated infrastructure (including fiber optic and other cables) must be elevated at or above the 7-foot minimum height except at those points where the pipeline intersects a road, pad, or caribou ramp, or is constructed within 100 feet of an existing pipeline that is elevated less than 7 feet.
27	Onshore Oil and Gas Pipelines and Roads – Placement	Pipelines must be separated from roads by a minimum distance of 500 feet (except at those points where the pipeline intersects a road, pad, or caribou ramp).
28	Onshore Oil and Gas Pipelines and Roads – Placement	Pipelines shall not be constructed at a distance greater than 1,000 feet from any access road.
29	Onshore Oil and Gas Pipelines and Roads – Placement	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited on the lake or lakebed and within 1,500 feet of the ordinary high-water mark of any fish-bearing deep lake (i.e., depth greater than 4 meters). If the fish-bearing status of a lake is unknown, the burden is on CPAI to demonstrate whether fish are present.
30	Onshore Oil and Gas Pipelines and Roads – Drainage	Appropriate facilities shall be installed to ensure adequate drainage patterns.
31	Onshore Oil and Gas Pipelines and Roads – Sedimentation	CPAI will monitor for sedimentation build-up or scouring resulting from all bridges and provide the Administrator with results of such monitoring on a regular basis. The Administrator may require measures to mitigate sedimentation and scouring, including dredging, to ensure that the subsistence use area is maintained.
32	Economic Opportunity – Job Fairs	CPAI will host a job fair annually in Nuiqsut beginning after the Assembly's approval of CPAI's Application.

No.	Category	Stipulation or Mitigation Measure
33	Economic Opportunity – Employment Reports	CPAI shall submit annual reports to the Administrator by December 1st of each year showing the number of NSB residents employed by CPAI by job type. Overall employment statistics will be part of this reporting, showing the percentage of NSB resident employment, separate for Alaska resident employment. The overall employment report will also reflect the total workforce, by resident location, of CPAI' s workforce in Alaska.
34	Economic Opportunity – Bids	When CPAI solicits bids, it shall invite North Slope suppliers, subcontractors, and regional and village corporations to bid on Willow projects for which they are qualified.
35	Economic Opportunity – Subsistence Policy	NSB strongly urges CPAI to adopt a formal policy to avoid scheduling disruptions and misunderstandings when subsistence leave is needed while employed by CPAI. The use of seasonal employment options as a method of addressing subsistence leave flexibility is not a meaningful method of employment that allows NSB residents to gain CPAI workplace experience. This requirement should be passed onto all CPAI contractors to the maximum extent allowable.
36	Economic Opportunity – Land Management Orientation	NSB shall provide land management orientation for CPAI for its Willow projects on an annual basis.
37	Economic Opportunity – Subsistence Representative	CPAI shall fund a year-round subsistence representative.
38	Cultural and Historical Site Protection – Data Points for Critical Sites	CPAI must contact the NSB IHLC Division at (907) 852-0422 and SHPO to obtain a set of data points for sites of possible historic, prehistoric, cultural, traditional, archeological, and paleontological significance (Critical Sites). CPAI will maintain the data provided by IHLC in a secure place for internal use only and shall not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of the planned Willow and associated developments and associated facilities, including roads, bridges, gravel pads, airstrips, and pipelines. CPAI will retain and update this data throughout the life of the development project. Prior to the completion of the development project, CPAI will come to an agreement with IHLC as to the disposition of IHLC data once the project is completed. Data points provided by IHLC in the form of geographic coordinates may be imprecise. CPAI is nevertheless responsible for ensuring that its operations do not cause any adverse impacts to Critical Sites and for reporting to IHLC the proper coordinates of any such site discovered. CPAI will release NSB from any liability associated with CPAI's use of these data points.
39	Cultural and Historical Site Protection – Buffer Zones	CPAI must maintain an effective buffer zone around all sites of possible historic, prehistoric, cultural, traditional, archeological, and paleontological significance (Critical Sites). An effective buffer zone will be at least 500 feet unless a smaller zone is necessary and can be mutually agreed upon by CPAI and the NSB Planning Department. CPAI must train its staff and contractors to observe this buffer and ensure that Critical Sites are not disturbed.
40	Cultural and Historical Site Protection – Discovery of Remains or Materials	Should any human remains or possible historic, prehistoric, cultural, traditional, archeological, and paleontological significant materials (Critical Site materials), including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains, be discovered in the course of this field survey that were not already identified by IHLC or SHPO, CPAI must stop all work in the vicinity of the discovery until CPAI has made contact with IHLC at (907) 852-0422, SHPO and, in the case of human remains, the Alaska State Troopers, and has obtained these agencies' approvals to continue work. CPAI must submit any information discovered that may be of historic, prehistoric, cultural, traditional, archeological, and paleontological significance to IHLC (including, but not limited to artifacts, house mounds, grave sites, ice cellars, and fossilized animal remains). CPAI must not disclose that data to any other person or entity except SHPO and those entities with a need to know for the purposes of working on the planned Willow and associated developments and associated facilities (including roads, bridges, gravel pads, airstrips, and pipelines). CPAI must not remove or disturb any items that may be of historic, prehistoric, cultural, traditional, archeological, and paleontological significance, except to the extent needed to document their existence and to comply with state and federal law and this ordinance.
41	Cultural and Historical Site Protection – Allotments	CPAI must not trespass on Native Allotments or private property. Owner permission must be obtained in advance to enter onto the surface of these lands. CPAI must work with the Inupiat Community of the Arctic Slope and Native Allotment owners in and around the area in a beneficial manner.

No.	Category	Stipulation or Mitigation Measure
42	Cultural and Historical Site Protection – Site Visits	Upon IHLC's request, CPAI must allow an IHLC representative to accompany CPAI during field work. The IHLC representative shall comply with all CPAI safety and operational rules and requirements when accompanying CPAI during field work.
43	Reclamation Plan – General	An abandonment/reclamation plan must be submitted to the Administrator within three years of cessation of permitted activities. At a minimum, the plan must contain: • A grading and site plan drawn and certified by an Alaska licensed professional engineer or land surveyor, indicating the areas excavated or filled, the proposed finished grades and contours, drainage directions and any control structures to be installed. • The methods and plans to be employed for reclamation of the site during and after the activity shall be stated along with a timetable for completions. • A description of all roads and structures and a site map showing the locations of all roads and development which will be built indicating which ones will remain after cessation of activities. • A description of any known reclamation requirements of any other governmental entity, and a copy of any reclamation plan under development or in existence for the activity. • All maps shall be submitted at a scale of one inch equals 200 feet extending 200 feet beyond the site area with a maximum contour interval of five feet. The scale requirements may be adjusted by the Administrator to fit unusual circumstances.
44	State, Local, and Federal Compliance – Other Permits	This approval shall not become effective until all other local, state, and federal permits, approvals, and authorizations have been issued. CPAI shall comply with all local, state, and federal laws and regulations for all projects within the Unit area.
45	Tundra Protection – General	Vehicles must be operated in a manner such that the vegetative mat of the tundra is not disturbed, and blading or removal of tundra or vegetative cover is prohibited unless specifically approved by the NSB Land Management Administrator or his designee.
46	Tundra Protection – General	Development is required to maintain the natural permafrost insulation quality of existing soils and vegetation.
47	Tundra Protection – General	Trails, campsites, and worksite must be kept clean. No littering is allowed. All solid waste including incinerator residue must be backhauled to an authorized solid waste disposal facility.
48	Tundra Protection – General	Winter on-tundra travel may begin when six inches of snow cover and twelve inches of frost depth conditions exist, consistent with State regulations, for the activities intended as determined by an authorized field representative of the Administrator. Certain on-tundra activities may begin sooner than others depending on the impact or magnitude of the operations.
49	Tundra Protection – General	After April 15 of each year, on-tundra travel must be subject to termination within 72 hours of notification by the NSB Administrator or his/her designee for protection of surface vegetation.

Note: ADF&G (Alaska Department of Fish and Game); BLM (Bureau of Land Management); CPAI (ConocoPhillips Alaska, Inc.); DWM (Department of Wildlife Management); GPS (global positioning system); IHLC (department of Inupiat History, Language and Culture); KSOP (Kuukpik Subsistence Oversight Panel); Kuukpik (Kuukpik Corporation); NSB (North Slope Borough); NVN (Native Village of Nuiqsut); SHPO (Alaska State Historic Preservation Office); USFWS (U.S. Fish and Wildlife Service).

Table I.6.2. North Slope Borough Rezoning Conditions of Approval*

No.	Category	Condition of Approval
1	Wildlife Disturbance – Gravel Infrastructure	CPAI will use insulation in the Willow gravel infrastructure to reduce the height (and visual barrier) of these features to minimize impacts on caribou movement, subject to obtaining necessary permits and agency authorizations. CPAI will submit a detailed implementation plan, including explanation of where insulation is and is not practicable, to the NSB by September 30, 2021, pursuant to NSBMC Chapter 19.50.
2	Wildlife Disturbance – Airstrip	CPAI will reduce the length of the Willow airstrip to a maximum 5,700 feet long. Final approval of the airstrip dimensions will be determined in accordance with NSBMC Chapter 19.50. CPAI has no plans to use the Willow airstrip for Boeing 737s or similar passenger aircraft, and therefore will leave the surface of the runway as gravel. Any modification of this condition, including the use of Boeing 737s or similar passenger aircraft, will require approval of the NSB Assembly. The airstrip permit application will include an analysis of required runway dimensions based on aircraft manufacturer guidance, Federal Aviation Administration requirements and recommendations, safety considerations, and engineering best practices.
3	Use Plans – Vehicle Plan	CPAI will provide the NSB a vehicle plan that includes restrictions on, and minimization of vehicle use, during sensitive periods (e.g., caribou calving, bird nesting, peak caribou subsistence activity). The objective of the vehicle plan is to mitigate potential impact of Willow project vehicle traffic on caribou calving, bird nesting, and peak subsistence activity. A vehicle plan for construction activities beginning in 2022 will be developed in consultation with the North Slope Borough Wildlife Department, and submitted for review and approval, in accordance with NSBMC Chapter 19.50, no later than September 1, 2021 and updated as needed when drilling and operations commence.
4	Use Plans – Aircraft Plan	CPA will provide the NSB an aircraft plan that minimizes aircraft use during sensitive time periods (e.g., caribou calving, bird nesting, peak caribou subsistence activity) and will include a communication protocol with the local community. The objective of the aircraft plan is to mitigate potential impact of Willow project air traffic on caribou calving, bird nesting, and peak subsistence activity. An aircraft plan will be developed in consultation with the NSB Wildlife Department and submitted for review and approval, in accordance with NSBMC Chapter 19.50, at least six months prior to the Willow airstrip commissioning.
5	Use Plans – Diesel Use Plan	CPAI will submit a diesel use plan for review and approval, in accordance with NSBMC Chapter 19.50, by October 31, 2021. The plan will include an analysis of diesel transportation, including the conversion of existing pipelines or the utilization of Willow pipelines authorized in the Willow Master Development Plan Environmental Impact Statement Record of Decision for diesel transportation. The objective of this plan is to minimize traffic impacts and spill impacts due to human error on roads in high-use subsistence areas.
6	Subsistence – Good Neighbor Policy	During the construction period of the Willow Project (prior to start-up of the central processing facility), if requested by the NSB Subsistence Mitigation Committee, in addition to the existing contributions, CPAI will provide an annual air charter for a group of Nuiqsut hunters and their gear to support caribou subsistence activities. This will be requested and administered by the NSB's Subsistence Mitigation Committee. CPAI will develop a Good Neighbor Policy on caribou in consultation with the community of Nuiqsut and the NSB Wildlife and Planning Departments. CPAI will host at least one community workshop in the Village of Nuiqsut to obtain input from hunters and residents prior to October 31,2021. The Good Neighbor Policy will include support to transport Nuiqsut caribou subsistence hunters and their gear to and from areas where caribou are available if it is determined that the Willow Project has significantly impacted the ability of the hunters to harvest caribou based on criteria in the Good Neighbor Policy. The determination will be made by the Director of the North Slope Borough Planning Department, in consultation with the North Slope Borough Wildlife Department. CPAI will submit a Good Neighbor Policy to the North Slope Borough on or before June 30,2022 for review and approval, in accordance with NSBMC Chapter 19.50.

No.	Category	Condition of Approval
7	Mitigation – Mitigation Fund Agreement Amendments	CPAI will amend Section 1(b) of the Oil Spill Mitigation Fund Agreement for the Alpine Development District (executed August 2019) ("Agreement"), to incorporate the Willow Development District into the Agreement, with an effective date prior to Willow first oil. The Agreement will also be amended to include spills to land. To accomplish that, Section 2(a)(i) of the Agreement will be deleted in its entirety and replaced with the following: "CPAI's oil and gas activities in the Alpine or Willow Development Districts cause oil to be present on land or in the water, or on the ice over water." CPAI will submit this amendment for NSB review and approval, in accordance with NSBMC Chapter 19.50, six months prior to anticipated Willow first oil.

Note: CPAI (ConocoPhillips Alaska, Inc.); NSB (North Slope Borough); NSBMC (North Slope Borough Municipal Code).

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Willow Master Development Plan

Appendix I.2
ConocoPhillips Road Optimization Memorandum

August 2020

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ConocoPhillips Road Route Screening Process

June 5, 2019

Introduction

On March 3, 2019, ConocoPhillips Alaska, Inc. (CPAI) hosted a meeting with the Bureau of Land Management (BLM), the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (USACE). The purpose of the meeting was to review the evolution of road route concepts assessed by CPAI for the Willow development. From 2017 through the first half of 2019, CPAI undertook a significant program of field research and data gathering to inform infrastructure placement and road routing options for the Willow development. CPAI initially considered over 20 road route options, which were screened by CPAI down to three development concepts for analysis in the Environmental Evaluation Document (EED). This memo summarizes the process used by CPAI to generate road route concepts, and to perform screening evaluations of those concepts. This memo also documents information that was discussed during the March 3rd meeting with EPA and the USACE.

Initial Route Creation and Screening

Beginning in 2017, information was compiled and analyzed by a multidisciplinary team of civil engineers, petroleum engineers, environmental scientists, biologists, North Slope operations personnel, geoscientists, and construction planners in order to identify and minimize potential environmental impacts in addition to optimization of the overall road routing.

CPAI personnel and consulting experts identified initial road segments using a combination of satellite imagery and aerial photography, environmental studies (caribou, fish, avian, wetlands, hydrology, and cultural resource surveys), exploration and environmental field expertise, and an awareness of subsistence hunters' perspectives. Twenty-two road segments were developed, which were then organized into eight potential road alignments. Figure 1, below, shows the initial route alignments.

Figure 1. 2017 Initial Willow Road Segments

CPAI screened the road route options considering the following:

- Best Management Practices (BMPs) and Stipulations from BLM's 2013 Integrated Activity Plan for the NPR-A
- Guidelines in the BLM NEPA Handbook

- Section 404 of Clean Water Act and Section 10 of the Rivers and Harbors Act considerations, including a Least Environmentally Damaging Practicable Alternative (LEDPA). Practicability included costs, safety, and logistics.
- National Environmental Policy Act (NEPA) guidelines on alternatives selection
- Key comments from stakeholders on recent developments in the region
- Light Detection and Ranging (LIDAR) survey data, and a preference to avoid higher value wetlands
- Integrated Terrain Unit (ITU) habitat and wetlands mapping
- Avian Studies including yellow-billed loon nest observations
- Fish surveys and lake bathymetry data
- Hydrology studies
- Cultural resource surveys
- Subsistence surveys, including an awareness of locally important resources, methods, and use areas
- Caribou surveys
- Engineering recommendations for suitable bridge crossing locations and bridge span length
- Total road mileage and acreage of gravel fill in wetlands
- Support for future development by potentially reducing impacts from future projects on other CPAI leases
- Spill avoidance, inspection, and response
- Health and safety considerations

During the summer and fall of 2017, CPAI conducted studies to inform initial road routing options from infrastructure in the Greater Mooses Tooth Unit (GMTU) to the early Willow drillsite locations (CW-01 through CW-05).

Note that the early Willow drillsite locations are not the same locations as those now being considered for the Willow Master Development Plan (MDP) Environmental Impact Statement (EIS). Rather, the early locations were determined based on subsurface information known at the time. Drillsite locations have since been refined based on additional information as described below.

The initial eight road alignments were split into three categories:

- Northern routes: The most direct access from GMT2 to the early Willow CW-01 and CW-02 drillsite locations.
- Mid-routes: The most direct access to the full suite of Willow infrastructure including the proposed processing facility location, minimizing road lengths and providing the shortest bridge lengths at stream crossing locations.
- Southern Routes: These routes best complied with stipulations and/or BMPs in the 2013 Integrated Activity Plan (IAP; BLM 2013) and minimized the number of waivers required.

Criteria used to evaluate the eight routes included:

- Total road mileage, used to compare relative wetlands impacts and cost
- Judy Creek bridge crossing location and length, including potential impacts to streams from pier groups.
- Road length within the 3-mile wide Fish Creek setback established by IAP BMP K-1
- Conformance with other BLM stipulations including:
    - Avoidance of yellow-billed loon nest/nesting lake setbacks (IAP BMP E-11)

- Avoidance of 500-foot setback around waterbodies (IAP BMP E-2)
- Avoidance of ¼-mile setback around deepwater lakes (IAP BMP K-2)

- Route uniqueness compared with other routes.

Potential impacts to cultural resources were also considered, however, no impacts to cultural resources were identified for any of the evaluated routes thus it was not a differentiating factor in route selection.

Of the eight routes evaluated, four were screened out by CPAI and the remaining routes were analyzed in in more detail. Table 1 summarizes the eight routes evaluated and additional details are provided in the EED.

Table 1. Initial Road Route Alternatives Evaluated

Route	Road Miles[1]	Judy Creek Bridge (ft.)	Crosses Fish Creek Setback[2]	Crosses YBLO Buffer	Advanced for CPAI Analysis	Notes
North 1	37.6 mi	450	Y	Y	Y	Provides the most direct access from GMT2 to CW-01 and an optimal crossing location of Judy Creek with one of the shortest bridges. Includes essential crossing of the Fish Creek Setback (BMP K-1).
North 2	38.9 mi	-	Y	N	N	Similar to but longer mileage than North 1 and North 3. Places 2 miles of road in Fish Creek Setback (BMP K-1). Route not sufficiently distinct from other routes evaluated (North Route 1) but would require additional deviation from BMP K-1. Other similar routes (North Route 1, North Route 3) further minimize or avoid infrastructure in Fish Creek setback.
North 3	36.9 mi	1,400	N	Y	Y	Provides direct access from GMT2, but it would have a longer bridge crossing of Judy Creek than North 1.
Mid 1	35.5 mi	420	N	Y	Y	Provides shortest overall road length and minimizes tundra footprint.
Mid 2	42.3 mi	420	N	Y	N	Not sufficiently distinct from other routes evaluated (Mid Route 1) and would require additional deviation from BMP E-11. Other similar routes would have a smaller total footprint.
South 1	37.0 mi	1,850	N	N	Y	Conforms to BMPs and stipulations to the maximum extent practicable but has the longest bridge crossings of Judy Creek.
South 2	42.3 mi	1,850	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1). Other similar routes would have a smaller total footprint.
Southwest	37.3 mi	-	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1) and would require additional deviation from BMP K-2. Other similar routes further minimize infrastructure near deepwater lakes.

[1] Road mileages evaluated with common crossing of Fish Creek to access northern drillsites
[2] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

In addition to the eight routes discussed above, two Fish Creek crossing locations were also considered to connect drillsites CW-04 and 05 to the CW-02 area: west and central routes (see Figure 1). Table 2 describes the routes considered.

Table 2. Fish Creek Crossing Alternatives Evaluated

Route	Road Miles	Fish Creek Bridge (ft.)	Crosses Fish Creek Setback[1]	Crosses YBLO Buffer	Advanced for further CPAI Analysis	Notes
West	12.9	850	N	N	Y	Avoids known yellow-billed loon setbacks (BMP E-11) and provides the shortest alignment to early drillsite locations.
Central	13.4	650	N	Y	N	Provides shortest Fish Creek bridge but requires more road length, gravel fill, and crosses through yellow-billed loon setback (BMP E-11) near Fish Creek.

[1] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

Figures 2 through Figure 5 show the four road routes that were advanced during the 2017 screening process.

Figure 2. North Route 1 Road Alignment

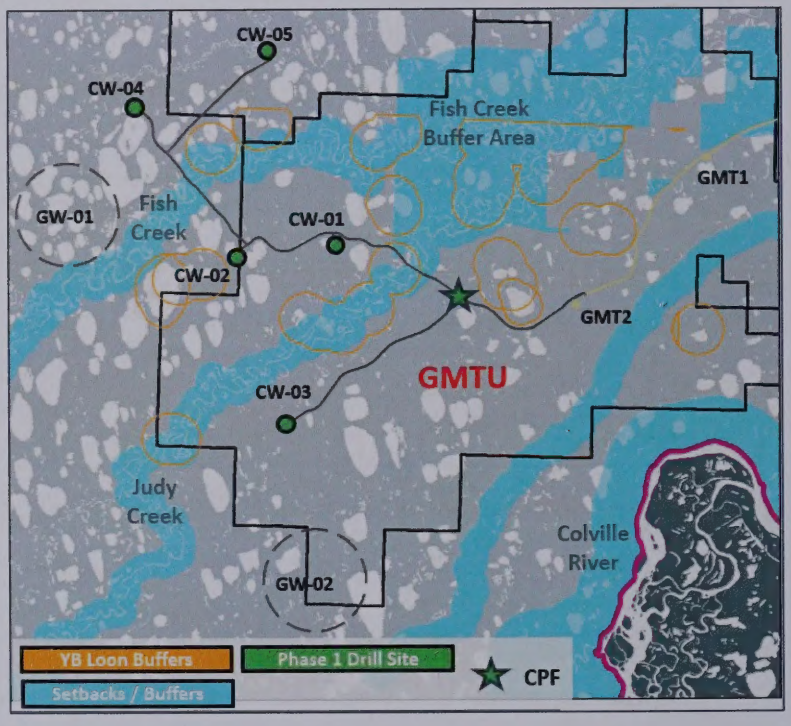


Figure 3. North Route 3 Road Alignment

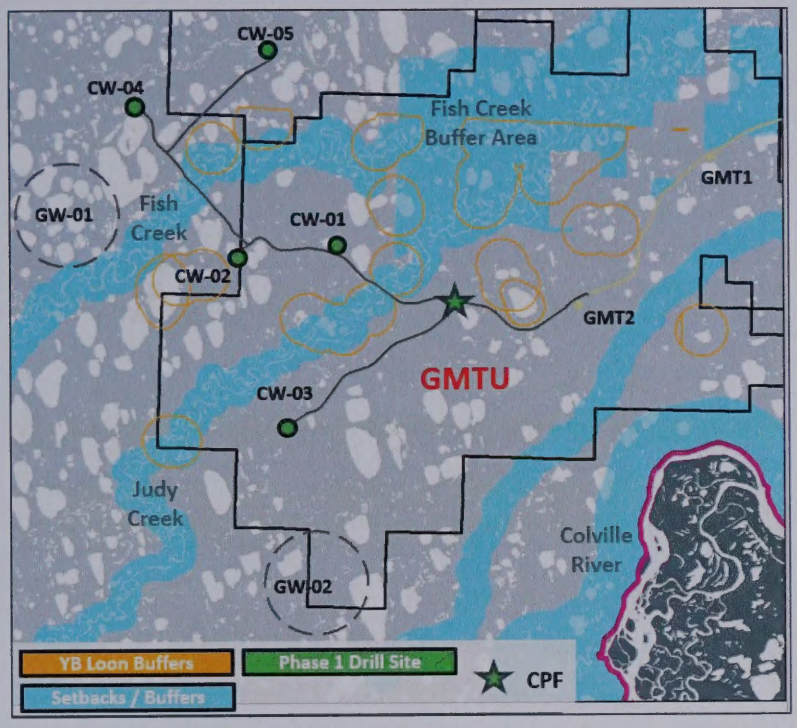


Figure 4. Mid Route 1 Road Alignment

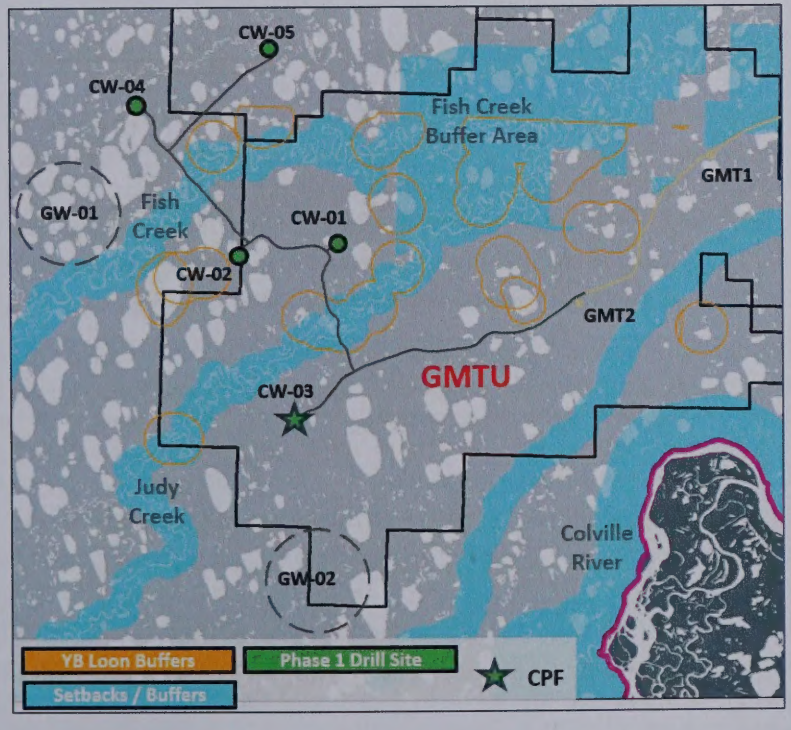
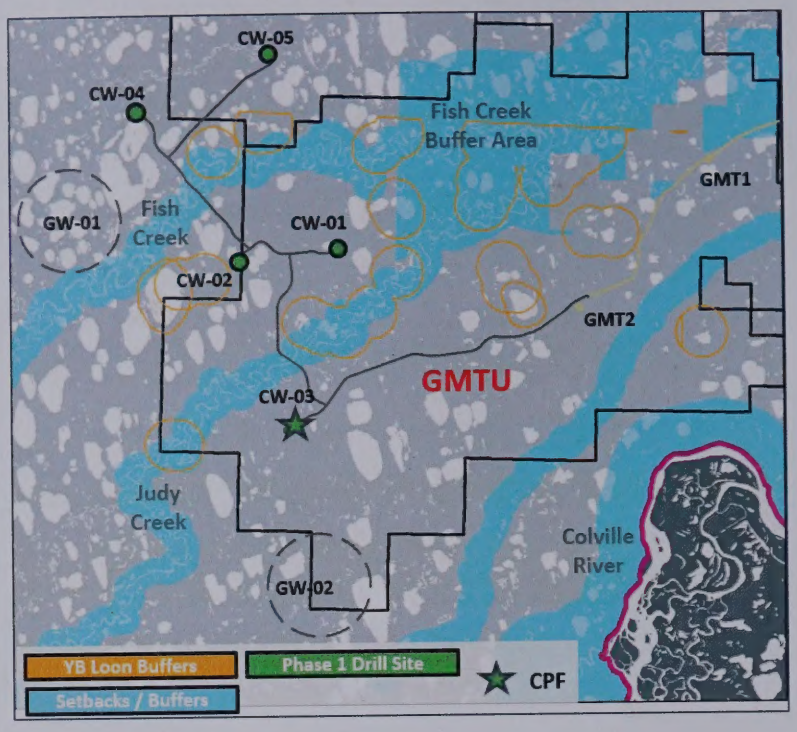


Figure 5. South Route 1 Road Alignment



Drillsite Location Refinement and EED Route Identification

After analyzing subsurface data from the 2018 Willow appraisal drilling season, CPAI refined some drillsite locations to further optimize recovery of the subsurface resource, while minimizing surface disturbance. The updated drillsites were located within the overall geographic area as the original sites, and the road routing evaluation criteria that was used during the previous screening effort was utilized to assess road route options to the new drillsite locations. Project engineers reevaluated the same general alignment corridors, bridge crossing locations, and road segments identified in 2017. During the spring and summer of 2018, LIDAR surveys were conducted throughout the field in order to further refine road routings, stream crossings, and bridge locations. New data from ongoing environmental studies including hydrology, avian surveys, fish surveys, ITU and wetlands mapping, and caribou surveys were also incorporated into route development and evaluation. CPAI shared the initial road alignments with the BLM and other regulatory agencies and received feedback that was also incorporated into road alignment reevaluation.

Route development and evaluation criteria and considerations were similar to those identified during initial route creation and screening but incorporated additional and/or more refined data. Criteria used for route development and evaluation included:

1. Gravel Footprint: Early analysis utilized road mileage as a surrogate for gravel footprint, as it assumed constant road width and depth based on aerial photography. Subsequent analysis used the LIDAR survey data and routings were optimized to avoid significant topographic changes that would increase gravel depth and footprint.
2. Caribou Migration Effects: Care was taken to minimize the potential for corralling effects due to loops or forks in the road.
3. Avoidance of Special Areas: Priority was given to avoidance of the Fish Creek 3-mile buffer (BMP K-1) as well as minimizing roadway length in the Judy Creek and Fish Creek ½-mile buffers upstream of the Fish Creek/Judy Creek confluence (BMP K-1). Additional special area considerations given to the Colville River Special Area and the Teshekpuk Lake Caribou Habitat Special Area (BMP K-5)

4. Stream Crossings: Routes were selected and evaluated with consideration given to the minimization of stream crossing impacts, mainly evaluated by the number of pile groups or pier groups in waterbodies.
5. Yellow-billed Loon Setback: Routes minimized crossing yellow-billed loon setbacks (defined as the area 1-mile from identified nests and 500 meters from the nesting lakes as stipulated in BMP E-11). Some routes may cross buffers where tradeoffs exist between crossing a setback and other potential environmental impacts, such as increased gravel fill. Discussion with BLM personnel in 2018 indicated that a waiver process allows for encroachment into setback, if it avoids causing more substantial impacts elsewhere, and that reducing gravel fill should be prioritized over encroaching within the setback.
6. Waterbodies Setback: Routes maintained waterbodies setback of 500 feet as stipulated in the 2013 IAP (BMP E-2)
7. Deep Water Lakes Setback: Routes maintained deep water lakes setback of ¼ mile as stipulated in the 2013 IAP (BMP K-11)
8. Teshekpuk Lake Caribou Habitat Area: Minimization of footprint in the Teshekpuk Lake Caribou Habitat Area (IAP BMP K-5)
9. General use of higher, drier ground: This is both a good engineering and maintenance practice, as well as use of a general assumption that drier ground was correlated with less highly functioning wetland areas.

Based on this evaluation, two road alignments, generally based on the Mid Route 1 and South Route 1 initial road alignments, were selected for further analysis as part of three alternatives within CPAI's Willow MDP EED.

EED Alternative 1

EED Alternative 1 was based generally on the road alignments evaluated as part of the Mid Route 1 alignment. The overarching goal in developing this road alignment was to minimize wetland impacts by selecting the most direct route from GMTU to proposed Willow facilities. This included the minimization of road length as well as the minimization of road footprint through optimization of topography by locating the road on generally higher, drier ground. It would also minimize wetland impacts by selecting optimal stream crossings to minimize bridge crossing lengths and gravel footprint within floodplains and adjacent wetlands. Alternative 1 would provide the shortest road alignment between drillsites and minimize the length of the Judy Creek bridge (420 feet) but it has the tradeoff of passing through yellow-billed loon nest/nesting lake setbacks near Judy Creek and would have a longer bridge at the Fish Creek crossing (1,100 feet). (Note: please refer to the EED for maps of the EED Alternatives.)

EED Alternative 2

Based on guidance from the BLM, this alternative sought to minimize the number of waivers to the 2013 IAP BMPs but requires tradeoffs of a greater gravel footprint and sub-optimal stream crossings. A major factor in this routing is avoidance of the yellow-billed nest buffers (BMP E-11), which drives additional road length, a longer bridge crossing of Judy Creek stream, the longest road mileage of the routes considered, and substantially more infrastructure in the Teshekpuk Lake Habitat Area (BMP K-5).

EED Alternative 3

This alternative evaluated a development scenario where the Willow area is not connected by gravel road to GMTU. This alternative reduces overall gravel footprint but results in tradeoffs of additional air traffic, freshwater use, subsistence impacts and reduced stakeholder access benefits, and challenges in emergency response (including spill) access. The gravel road alignments from the Willow processing facilities to each drillsite follow the same alignments considered as part of EED Alternative 1.

EED Alternative Evaluation

Table 2 summarizes CPAI's analysis of the road alignments evaluated in the Willow EED (September 2018) based on the evaluation criteria. Based on the overall minimization of gravel fill (and thus minimization of fill in wetlands and other water of the U.S.), minimization of the length of the Judy Creek bridge crossing, and balancing other environmental tradeoffs including compliance with the 2013 IAP BMPs, CPAI selected Alternative 1 as its proposed project for Willow development.

Table 2. Alternative Road Routes Evaluated

Project Component		Alternative 1	Alternative 2	Alternative 3
Gravel Roads		37 miles; 273 acres Eight 0.3-acre turnouts with ramps (2 acres total)	45 miles; 326 acres Nine 0.3-acre turnouts with ramps (3 acres total)	28 miles; 200 acres Six 0.3-acre turnouts with ramps (2 acres total)
Bridges (number)		8	10	7
Bridges (length)	Judy Creek	420 feet	1,850 feet	420 feet
	Judy Creek Kayyaaq	75 feet	Crossing 1: 75 feet; Crossing 2: 75 feet	75 feet
	Fish Creek	1,100 feet	850 feet	1,100 feet
	Kalikpik River	500 feet	550 feet	500 feet
	Willow Creek 2	80 feet	80 feet	NA
	Willow Creek 4	130 feet	130 feet	130 feet
	Willow Creek 4a	90 feet[1]	90 feet[1]	90 feet[1]
	Willow Creek 5	NA	20 feet[1]	NA
	Willow Creek 7	NA	75 feet[1]	NA
	Willow Creek 8	30 feet[1]	NA	30 feet[1]
	Other	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required
Acres in Special Areas	Acres in Colville River Special Area	8 acres	8 acres	NA
	Acres in Teshekpuk Lake Special Area	110 acres	130 acres	103 acres
Compliance with BLM BMPs	Acres in Teshekpuk Lake Caribou Habitat Area (BMP K-5)	19 acres, no deviation anticipated	56 acres, no deviation anticipated	19 acres, no deviation anticipated
	Yellow-billed Loon Nest/Lake Setback Deviations (BMP E-11)[2]	Lake M0151 (nesting lake shoreline setback) Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)	Lake M0151 (nesting lake shoreline setback)	Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)
	River Setback Deviations (BMP K-1)	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek
	Deepwater Lake Setback Deviations (BMP K-2)	Lake M0015	Lake M0015	Lake M0015

[1] Bridge versus culvert battery crossing structure to be determined.
[2] 1-mile nest setback and 1,625-foot (500-meter) nesting lake shoreline setback.
Notes: All values are approximate and subject to change; BMP: best management practice.

EIS Alternative Development

A description of the EED Alternatives was submitted to BLM and co-operating agencies in May 2018 and updated in September 2018. CPAI understands that these alternatives were considered by the agencies as part of the EIS alternative development process.

Since submittal of the EED, CPAI has also supported EIS alternative development through technical and engineering support. This has included further refinement and changes to the proposed project based on agency feedback. For example, in October 2018, at the request of BLM and co-operating agencies, CPAI evaluated moving the BT4 drillsite out of the Teshekpuk Lake Caribou Habitat Special Area (K-5) and east of the Kalikpik River. While infrastructure and development are allowed within the K-5 area, the agencies suggested locating the drill site outside of this area if practical. CPAI evaluated this request and was able to accommodate it with an associated negative impact to subsurface resource recovery. The shift of the BT4 drillsite caused another evaluation of the road route between BT2 and BT4 including the elimination of a bridge over the Kalikpik River.

CPAI also continued to advance engineering for the proposed project this spring to further avoid and minimize impacts. The most recent revision to the proposed project (March 2019) optimized the road alignments by incorporating the latest topographic data, gathered in the summer of 2018. Changes to the road alignments were made to avoid wetlands that are permanently inundated (H class water regime) or located within 500 feet of fish bearing waters. These changes were made in locations where design constraints would not be compromised. Updates have also been made to estimates of bridge lengths with specific focus on the Fish Creek crossing, reducing the bridge length from the June 2018 concept of 1,100 feet down to the current concept of approximately 500 feet.

Conclusions

From eight original route routes considered, CPAI screened out five using the criteria described above, and then advanced three for inclusion in the EED. CPAI understands that BLM is including CPAI's proposed project and two alternatives in the draft EIS that is in preparation, and that the three EIS alternatives share similar road alignments. While CPAI anticipates further refinements to road alignment may occur as engineering and the NEPA and permitting processes progress, the substantial analysis already completed demonstrate that the road alignments carried forward in the EIS meet the requirements of the 404(b)(1) Guidelines which requires a LEDPA project. As the routes evaluated by CPAI demonstrate, other road alignments, which are not included in the EIS, are unlikely to meet LEDPA requirements because they would result in greater fill to wetlands and would have a greater impact to the environment compared to the alternatives which are included in the EIS.

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Willow Master Development Plan

Appendix I.3
Dust Control Plan

August 2020

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Willow Dust Control Plan

Scope

This Standard Operating Procedure (SOP) applies to ConocoPhillips Alaska, Inc. (CPA) and contractor personnel at Willow.

Regulatory Requirement

Fugitive dust consists of particulate matter (PM). The U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation (ADEC) define fugitive dust as "particulate matter that is generated or emitted from open air operations (emissions that do not pass through a stack or a vent)." The most common forms of PM are known as PM10 (particulate matter with a diameter of 10 microns or less) and PM2.5 (particulate matter with a diameter of 2.5 microns or less).

Alaska's current regulations that address fugitive dust include:

- 18 AAC 50.045(d)[1]: A person who causes or permits bulk materials to be handled, transported, or stored, or who engages in an industrial activity or construction project, shall take reasonable precautions to prevent particulate matter from being emitted into the ambient air.
- 18 AAC 50.110[1]: No person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property.

Currently, ADEC applies its regulatory authority under 18 AAC 50.045(d)[1] to request fugitive dust sources apply “reasonable precautions” to reduce emissions.

Fugitive Dust Sources

Fugitive dust could be generated directly from road and pad construction, facility construction, and during operations and maintenance. The following construction activities are typical examples of activities that have the potential for generating fugitive dust:

- Movement of vehicles and motorized equipment
- Bulldozing and grading
- Excavation and filling
- Blasting
- Material movement, including loading and unloading
- Hauling of loose materials
- Use of parking, staging, and storage areas

[1] 18 AAC 50 as amended though January 8, 2020.

It is the responsibility of the Project entity's Construction Contractor(s) and the Project entity's Field Environmental Coordinators to ensure all sources of dust generation are identified.

Purpose

The purpose of this Standard Operating Procedure is to ensure compliance with ADEC air quality regulations, summarized above, and applicable project permitting stipulations, such as from the Bureau of Land Management, the U. S. Army Corps of Engineers, or the North Slope Borough. (Future update after permits are issued: permit numbers to be added as references, from any permits containing relevant fugitive dust stipulations).

Engineering & Administrative Controls

The Willow road and pad construction is typical of North Slope design and installation, consisting of a minimum of 5 foot of gravel fill above tundra level with 2:1 side slopes. The roads are designed with dust control in mind, and the specifications call for well graded sandy-gravel with low fines content in order to minimize both dust (during dry and/or hot conditions) as well as mud during the shoulder seasons and especially wet summer weather.

Willow utilizes both the Western North Slope (WNS) standard 32 foot wide (shoulder to shoulder) roads within the core field area, as well as 24 foot wide (shoulder to shoulder) roads at the outlying drill sites. Speed limits on the 32 foot wide roads are generally 35 mph. Due to safety concerns, speeds are reduced to 25 mph on the 24 foot wide roads. Speed limits are enforced by Security personnel. The table below displays road width and speed limits by segment.

Road Segment	Width (feet, driving surface)	Speed Limit (mph)
GMT2 to WOC	32	35
WOC to WCF	32	35
WOC to BT1	32	35
BT1 to BT2	32	35
BT2 to BT4	24	25
WCF to BT3	24	25
BT3 to BT5	24	25

Procedures

Large-scale dust control will be accomplished using on-site water trucks or other suitable equipment. Planned dust control equipment at Willow currently consists of two 325 bbl capacity water trucks, operating 24 hours per day under normal operations. However, if the need arises, vacuum trucks operating in other services can be utilized temporarily as dust control trucks. Dust

control activities will be monitored and scheduled by Western North Slope (WNS) Roads and Pads personnel. Activities will be conducted in a manner to comply with applicable permit stipulations. The following procedures will be utilized during dust control activities:

1. Conduct annual training for dust control regarding permit stipulations application, procedures, and techniques, identification of dust control areas, and location of permitted water sources.
    a. All Roads & Pads operators will be provided annual training that includes:
        i. Importance of proper dust control (air permit fugitive emissions stipulations, USACE permit stipulations, vegetation impacts, etc.)
        ii. Permit stipulations pertaining to water sources (fish screens, volume tracking, ADEC dewatering log, etc.)
        iii. Identification of areas needing dust control (road and pad surface conditions, lighter colored areas developing, discoloration of snow, visible dust in road, etc.)
        iv. Priority areas for dust control (active drilling locations and airstrips)
        v. Location of permitted water sources (impoundments, lakes and secondary containments)
        vi. Proper watering techniques (prevent erosion, ensure dust is controlled, etc.)
2. Reduce dust control activities when precipitation (rain, snow, frost, dew, fog, etc.) provides adequate coverage.
3. Apply proper amount of water at appropriate rates of application to avoid the creation of localized erosion due to water runoff.
4. Collect water for dust control from permitted raw water sources (e.g., lakes, impoundments).
5. Routinely inspect and evaluate facilities regarding dust control.
6. The following list recommends a watering frequency based on the number of expected vehicle trips;
    - Main Roads (32 foot width) – Once per day or as needed.
    - Secondary Roads (24 foot width) – Every 3 days or as needed. Watering frequency will increase to daily while there is an active drilling rig on the associated pad.

- WOC and WCF – Once per day or as needed.
- Drill Sites with rig activity – Every day or as needed.
- Drill Sites without rig activity – Every three days or as needed.
- Willow Airstrip – Twice daily or as needed.

7. Changes to watering frequency will be based on observations from Roads and Pads personnel, including gravel surface conditions, visible dust, or recent deposits on nearby snow or vegetation. Additional watering determinations are made at the discretion of the Roads and Pads Foreman and/or Operations personnel.

Inspection, Monitoring and Recordkeeping

Roads and Pads personnel will perform regular inspection and evaluation of facilities regarding dust control, and inspections will include surrounding areas to determine if visible dust accumulation are present on adjacent vegetation.

- Dust control activities and their effectiveness will be documented by recording to following information in a log book by the watering truck operator. Logs will include the following:
  - Date, time, and location (road segment)
  - Wind conditions (windy, calm)
  - Road surface conditions (dry, damp, wet).
  - Purpose: Watering for scheduled maintenance or based on road/pad conditions.

The watering logs will be available for review by interested local agency representatives upon request. Logs will be retained for a minimum of five years. Additional records of any deviations from the dust plan, along with the reasons for the deviation and corrective actions taken, will also be retained for at least five years.